To Dr Banmaya
with best wishes
[illegible]

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BIRCH'S

MANAGEMENT AND MEDICAL TREATMENT OF CHILDREN IN INDIA AND THE TROPICS

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BIRCH'S

MANAGEMENT AND MEDICAL TREATMENT OF CHILDREN IN INDIA AND THE TROPICS

EIGHTH EDITION

BY

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HISTORICAL NOTE.

This work, which is probably the oldest professional book still in publication in India, was originally written by Surgeon Henry Hurry Goodeve of the Bengal Medical Service, and published on 15th March, 1844, as a very small volume, privately printed, under the title, *Hints for the General Management of Children in India in the absence of Professional Advice.* It is of interest, perhaps, here to quote the original Preface to this first edition as it has been the keynote of all the subsequent ones.

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ORIGINAL PREFACE.

"In offering these few pages to my patients, I do not, for a moment, pretend to give them a complete treatise on children's diseases. Nor do I wish, in any way, to prevent their taking medical advice, where it can be obtained. On the contrary, I would earnestly caution them never to trust to their own judgment, when they can procure professional assistance. The observations and advice contained in this little pamphlet are intended merely to aid those (a large class in India) who are placed at a distance from the advice of medical practitioners: and if this work prove beneficial in a single case, I shall be amply repaid for the time I have bestowed upon the subject."

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A second edition was called for in less than six months and issued on 1st September, 1844. A third

followed in October 1852, and a fourth in 1856. Even this fourth edition was only a very small book of 138 pages. The fifth edition was edited by S. C. G. Chuckerbutty; the sixth by Joseph Ewart in 1872. The seventh edition was entirely re-written by Birch and was the first with which his name was associated, as little of Goodeve's original work remained. A second edition was published in 1886, a third in 1895, and a fourth in 1902.

Brigade-Surgeon Edward Birch was born in 1840 and died on 27th November, 1912. He entered the I. M. S. in 1866, and spent nearly the whole of his service in Bengal. He was Civil Surgeon of Hazaribagh, later Superintendent of the Presidency General Hospital, and later still Principal of the Medical College, Calcutta.

PREFACE TO EIGHTH EDITION.

The name of Lieut.-Colonel V. B. Green-Armytage has been associated with this work through three editions and it is owing to his energetic guidance that the book has survived so long. The study of pediatrics in India owes much to his influence and zeal. The present author who co-operated with him in the last edition sincerely regrets that his retirement from India has necessitated the production of a new edition without his assistance, though much that he contributed appears unchanged.

The intention of the authors of the more recent editions of this book has been to provide instruction, for mothers and also for practitioners, in the care of children in health and disease in India. The present author, in continuing this policy, believes himself justified—on the one hand, by the demand of mothers in the mofussil for a book which will enable them to meet the emergencies of sickness, as well as to guide them in the maintenance of health—on the other hand, by the reasonable claim that practitioners should be fully acquainted with those facts concerning the child which are essential to the knowledge of the mother. Lest the pursuit of the subject too deeply into technical matters should produce in untrained persons a sense of mystification and alarm, certain sections have been marked " for practitioners only ".

The author has included only methods that have been found, by trial and experience, suitable to this

country. He has been fortunate in being able to consult experts in all special subjects and is glad to acknowledge the assistance so readily given. The following gentlemen have helped with advice and information on various subjects:—Dr. L. E. Napier on kala-azar; Colonel Chopra on the properties and dosage of certain drugs recently introduced; Dr. Maplestone on the modern treatment of worms as investigated in the School of Tropical Medicine; Lieut.-Colonel A. D. Stewart in the sections on hygiene and prevention of disease; Dr. N. R. Gupta and Professor M. N. De on pathology and bacteriology and Lieut.-Colonel R. Knowles on snake-bite. Dr. N. J. Judah has largely written the section on the diseases of the ear, nose and throat; Lieut.-Colonel F. J. Anderson has revised and contributed to the section on first aid; Lieut.-Colonel E. O'G. Kirwan has re-written the chapter on the diseases of the eye, and Dr. J. P. Bose has furnished an appendix showing the vitamin content of the foods commonly used in India. Not the least helpful have been the long discussions with Dr. Profulla Das Gupta, late resident physician of the Medical College, on the relative prevalence of different diseases and the results of the lines of treatment selected for publication. Finally, my thanks are due to Dr. K. D. Chatterjee for reading the proofs and for many valuable suggestions as to the lay-out of the book.

E. H. V.·H.

January, 1936.

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CHAPTER I.

GENERAL CONSIDERATIONS.

Those who wish to bring up children in India must realise that they are undertaking a task which calls for special study, so that on the one hand they may be in a position to avoid the dangers that are real and on the other, they may not be haunted by dangers that are imaginary. On the whole, children up to the age of seven flourish, but it must be remembered that there are disadvantages both physical and mental against which it is the duty of the mother to guard. The difficulties are of climate, of feeding, of mental environment and lastly there is the threat of certain tropical diseases, happily to a great extent preventable. Against these it may be stated that the infectious diseases of childhood, when contracted, tend to run a milder and less complicated course and that diseases of the lungs, in well-cared-for children, are rare.

Many children stand up well to the hot weather of the plains, but as a rule, if not actually ill, they become listless, anæmic and fail to gain in weight. Further they are liable to develop disorders of the digestion and it is extremely difficult to supply them with the abundance of fresh food that they require. Briefly, when possible, the child should be taken to the hills for the hot months. As regards infants, there is a common belief that they do not feel the heat, a belief to which it is difficult to subscribe unreservedly. At the same time, it has fallen to the lot of many thousands of stalwart citizens to spend the first year of their lives in the plains, so the outlook must not be presented in too gloomy a manner. Special care, as will be detailed later, must be taken and, above all, the infant must be fed in a manner suitable to the climate and not on systems prevalent and productive of good results in Europe. The infant in India requires less food in the hot weather, about three-fifths of the amount which would be taken normally in the cold weather in England. The reasons for this are not far to seek; part of the food is burnt up to produce heat and in this country where the loss of heat from the body is less, the requirements for this purpose are naturally lowered. Part of the food is expended in muscular movements and here again in India there is a tendency for the child to be less lively, and finally, through want of the stimulus of cold air, the general chemical processes of the body are slowed down. Many children,

brought out to India at an early age, get a bad start through neglect of the above principles; the food, quite suitable in England, is not reduced when the zone is entered where requirements are less and disorders arise.

In dealing with infants, one of our main difficulties is to ensure adequate sleep; the rest may be disturbed by the discomforts of prickly heat and the mother, obsessed by fear of chills, is unwilling to expose the child to the punkah which renders existence tolerable to the parents.

As regards older children, the lack of progress and general want of activity are not necessarily entirely due to the heat, but to the want of certain essentials in the food, mainly in the direction of vitamins and mineral salts, which may, however, be supplemented judiciously.

It need hardly be stated that, in the care of children, attention to the rules of hygiene, essential as it is in more favourable climates, becomes doubly so in India, not only for the evasion of disease, but for the maintenance of good health and progress. The mother must not console herself with the thought that she may be taking the child home in the near future; the child must be kept in good health all the time or the seeds of a weakness to be felt later in life may be sown.

One word about the reprehensible habit freely indulged in by many persons of kissing and fondling babies. They should realise that by so doing they may convey serious infection to the defenceless infant who is at this time peculiarly susceptible. In the opinion of the writer it is an anti-social act and should be forbidden by law. No person, except the mother, should kiss the baby and she herself should refrain from doing so if she has any catarrh or sore throat and she should impress upon the nurse that she should prevent unauthorised persons from doing so in all circumstances.

Attention to the well-being of the child must not be fixed exclusively on the physical side, there is also the psychical side. The circumstances of the child's life are abnormal, there is constant change of scene and surroundings which is liable to exhaust the child mentally or produce that form of nervous irritability which is so commonly seen in this country. He lacks the tranquillity of the well-ordered English home and that routine which is essential if the mental poise is to develop without interruption. The child dislikes change. The same game played time after time, the same story told, the same accustomed toys, appeal far more than frequent variety. This is the instinctive struggle against mental indigestion. Remember how much the child has to acquire

in the first few years of life and spare all unnecessary strain on a mind which is gathering impressions and knowledge at an incredible speed. Already the nervous system of the child is on the side of over-activity in the tropics and no avoidable burdens should be further laid. The prevalent custom of providing frequent parties to young children in the hills is to be regretted. They serve no good purpose, they help to spread the inevitable infectious diseases of childhood to those too young to compete with them satisfactorily, they cause undue excitement in nervous children and they teach the child to be dependent on artificial entertainment instead of the more natural educative amusements of their own home. Young children are much happier in the company of a few companions for whom they have shown a preference.

The provision of attendants for the child presents some difficulty. Only the few can afford an English nurse and when they do, they should make every effort to provide her with congenial companionship and interests, so that she may not become bored and discontented, a frame of mind which will soon reflect on the child. Many ayahs are excellent, particularly the Hill ayahs, but they require close supervision especially with regard to cleanliness in feeding. They are apt to be too indulgent to their charges who tyrannise over them to the detriment of their manners and they anticipate too readily the wishes of the child so that he does not learn to do things for himself. They even delay progress in crawling and walking by handing to the child everything that he shows signs of wanting and thus removing all incentive to independent locomotion. In short, the mother must be prepared to devote a considerable amount of her own time to her children.

What has been said above, applies in the main to Indian children. They require the same supervision, the same type of feeding and the Indian community is now realising the value of a change to the hills. One further word may be added. Indian children as a rule, go to bed far too late and are not given regular hours of rest in the day-time.

Lest the foregoing remarks cause undue anxiety to those who are forced by circumstances to keep their children in India after the age of seven, let it be stated that there are now many excellent schools in the hills where children, under expert care and education, thrive exceedingly.

CHAPTER II.

THE EXPECTANT MOTHER.

The development of the infant from the earliest conception of life till the moment of birth is entirely dependent on the nourishment afforded by the blood of the mother and it is therefore of the utmost importance that she should "go into training", and devote the same care to the well being of the child before birth as she will after the child is born. The health of pregnant European women in hot countries is liable to deterioration so it is desirable that they should adopt more stringent precautions than would be necessary in temperate climates. Of prime importance is the diet which should be regulated on the following lines :—

DIET (GREEN-ARMYTAGE).

The following diet for all pregnant mothers is recommended, with the addition, if need be, of cod-liver oil and Parrish's Food for anæmia or diminished calcium content.

Cereals.—Oatmeal porridge or any of the breakfast foods, with milk. Brown or whole-meal bread, toast, rusks, cream cracker biscuits.

Vegetables.—Any vegetable in any form except fried.

Fruits.—Any fruit, either fresh or stewed.

Meat.—Beef, lamb, mutton, veal, not at all; or only very occasionally. Pork never.

Curry never.

Chicken (avoid duck, goose, or game).

Croquettes or rissoles, if not fried in deep fat.

Eggs.

Fish.—Any fresh fish, except hilsa.

Soups.—Any soup, thick or clear, but free from fat.

Sweets.—Any jam or jelly, marmalade or honey, but pure honey is best of all. Milk puddings. Boiled puddings occasionally. No pastry, no rich cakes.

Salads.—Any salad, but sparingly of salad dressing.

N.B.—Salads must be home grown and watered with clean water. No vegetables bought in the market should be eaten uncooked.

Fluids.—Water, ærated water, home-made lemonade, orangeade, weak tea, coffee, milk, as desired.

To the above diet may be added cod-liver oil in the winter and some form of iron tonic if there is anæmia.

Butter may be taken if desired, but not in large amounts. Cream, fat meats, and any fish fried in deep fat should be avoided. Fruits and vegetables must be taken at least twice a day, and meat, if at all, not more than once every other day. Mild cheese, such as St. Ivel's, is permissible.

There is good reason to believe that a considerable part of the formidable array of disease, including lack of growth and vitality, that beset the child and adult in the East is caused by food deficiencies and there can be no doubt that there is wide-spread shortage of vitamins in the diet of the poorer classes, due to adulteration of food. The deficiency in vitamin B is mainly due to the modern method of milling grain. Whole-meal bread contains seven times as much vitamin B as white bread and whole-meal bread should therefore be eaten when obtainable.

Fresh milk and cheese are the foods richest in calcium, and when these are taken in any quantity there will be sufficient calcium in the diet. The body needs 9 to 15 grains of calcium per diem. A pint of good cow's milk contains 10 grains.

There is very little iodine in the food or soil of Bengal, the lack of which is frequently responsible for lowered and disordered metabolism. This can be made good by taking iodised salt, known as Iodosal, instead of ordinary salt at meal times.

The use of alcoholic liquors in any form is to be deprecated. The expectant mother must not yield to the caprices of appetite so commonly experienced. She should take exercise in modera-tion, avoiding undue fatigue. Riding, dancing, and all violent exercises of a straining nature, such as lawn tennis, badminton, driving at golf, etc., should be avoided after the fourth month and at the times each month that the patient would be menstruating if she were non-pregnant. Walking is beneficial. The legs may be used, but the arms should be spared. It is not desirable that she should forego any of her usual house occupations. Late hours are to be eschewed. Rest in the horizontal position should be more freely indulged in than formerly. The bowels should be kept regular by means of diet, or, if necessary, by cascara or rhubarb. Such aperients as aloes and seidlitz powders, as well as all patent medicines of unknown composition, are to be avoided as dangerous. The dress should be loose, so as to allow space for the growth of the child and to give a freedom to the mother's lungs sufficient to compensate for the increased upward pressure of the womb on her chest. The greatest care should be taken to carry out the above precautions and avoid all over-exercise, or

fatigue, or jolting at and about those times when menstruation would have been due, for at such times, more particularly up to the fourth month, miscarriage is most likely to follow any error or indiscretion; and this must be remembered in planning a voyage or fatiguing railway journey and applied also to marital intercourse. As soon as conception is deemed probable or has occurred, professional advice should be sought, in order to obviate errors in conduct, for there is no doubt that in a tropical climate miscarriage more frequently occurs than in Europe and that in many cases this is preventable.

Such advice is of the utmost importance, if there has been previous trouble or mishap.

The perfect mother is placid and equable in temper, happy, good-natured and active. She should, as far as possible, pursue her ordinary interests. The dismal in thought and action must at all times be banished, for it must be remembered that inherited impressions and experiences constitute the bulk of an infant's mental equipment.

Suitable care should be given to the breasts. As they increase in size and weight, a suitably arranged bandage or silk handkerchief will reduce the dragging sensation. The nipple for three months before birth of the child should be daily cleaned with Eau-de-Cologne or spirits of wine and then rubbed with lanoline, or if they are retracted they must be drawn out daily with finger and thumb.

The mother in India is more subject to those disturbances of body chemistry which at times upset the normal course of pregnancy. Such disturbances can often be corrected if detected early. For this reason the urine should be examined once a month in early pregnancy and once a fortnight during the last three months. This examination is especially necessary should severe and persistent headaches be experienced. During the thirty-sixth to the thirty-seventh week the mother should submit to an examination as to the position and size of the baby relative to the mother. The correction of errors at this stage will prevent danger and ensure an easy delivery for mother and child. There are further special matters on which, should they arise, professional advice should be sought. In the early months—excessive severity of the normal daily vomiting, obstinate constipation, difficulty in passing urine, anæmia. In the later months—persistent absence of quickening after it has once started, persistence of vomiting, persistent pain in the abdomen, hæmorrhage, anæmia, headache, or fever in any form.

The superstition that quinine must not be taken by the expectant mother dies hard. Experience shows that the majority

of pregnant women suffering from malaria may be treated with adequate doses of quinine without any ill results, while the disease, if untreated is itself a potent factor in abortion. Of recent years Atebrin has been used with good effect and without harm to mother and child. As regards prophylaxis, Green-Armytage recommends that those residing in malarious places should take three grains of quinine daily at dinner time during the last six months of pregnancy.

Finally, it is important to recognise that not all fevers experienced during the carrying period are malarial. A very common type of fever often associated with rigors and definitely resembling malaria is seen in the tropics and is due to a *Bacillus coli* infection of the kidneys. This fever is accompanied by pain in the loins, most often on the right side and can be readily treated if borne in mind (vide *B. coli* infection). Such infections are commonly associated with and caused by chronic and usually unsuspected infection of *Entamœba histolytica* (the causal organism of amœbic dysentery).

CHAPTER III.

MANAGEMENT OF THE INFANT.

Section I.—The First Day of Life.

An infant, let us assume, has been born without accident, and separated from its mother. The essential points demanding immediate attention are :—care of the cord, warmth, and rest.

The cord having been inspected carefully to see that there is no oozing from it, the infant is to be rolled in flannel, which has been well warmed, and allowed to rest in the arms of an ayah or other warm place, while the necessary attention is being bestowed upon its mother. *Warmth* is at this moment of the greatest consequence, for the temperature of the newly-born infant falls several degrees below that which, during the rest of its life, will be natural to it, or which would subsequently be compatible with its vitality. *Rest,* for these few minutes after the comparatively violent exercise of struggling and handling, is a good thing, though hardly essential so far as it concerns delaying the next operation, namely, the bath, which should be warm and be given with "gentleness and rapidity".

If there is not a thermometer at hand, the elbow of the nurse immersed in the water will afford a fair test as to the appropriateness of the temperature. The hand should not be trusted to; it is not so sensitive as the thinner-skinned and habitually protected elbow.

Sometimes there is a large quantity of white sticky substance adhering to the child's skin; sometimes there is but a little; almost always some. The complete removal of this substance is usually easily effected by anointing, with a little friction, those portions of the skin upon which it is seen, with warmed oil. An emulsion is thus formed, which admits of ready removal with the sponge, soap, and water, while the child lies upon the nurse's lap, before immersion in the bath. Should it happen that all the white substance is not thus completely removed, no delay, or picking or rubbing, is justifiable in further attempts. Rapidity and gentleness are the really important points, and it is of no great consequence whether thorough dislodgment be effected; but it is of moment that neither chill nor exhaustion be imposed

upon the delicate organism. A word of caution as regards *the eyes,* during this first bathing, is necessary. Scrupulous care should be observed that none of the soiled water be permitted to enter them, otherwise the infant may commence its life with an attack of ophthalmia. Indeed it is doubtful whether it is not best in every case to follow the advice of Crédé and place a few drops of a 1 per cent. solution of silver nitrate into the eyes immediately after birth, and then gently and carefully to cleanse the parted lids with some boric lotion. The process of drying and the application of dusting-powder are now to be proceeded with.

The arrangement of the *navel-string* next claims attention. The first thing to be done is to re-examine it attentively for a moment, and if there is any appearance of blood oozing from it, to apply a fresh ligature close to that which is already upon it.

Great care must be taken that the cord be not jerked or pulled through carelessness. From the centre of a piece of soft, clean rag, a portion is cut sufficient to allow the cord to be passed through it, and this having been placed in position, a strip of similar rag which has been sprinkled with the dusting-powder (37), to which a sixth part or so of boracic acid powder had better be added, is to be gently wound round the cord, which should now be loosely coiled upon the flat piece which lies upon the abdomen. Over all a flannel binder is to be sewn with a wool-needle and cotton (pin should never be employed), and the process of dressing is to be completed. Then the infant should be wrapped in a soft woollen shawl and placed in its mother's arms, in close proximity to her body. Usually the baby will at this time fall asleep, and so remain for some hours. From such a slumber it should not be wakened. Should, however, there not be an inclination to sleep, the mother may at once apply the child to her breast, an act which will prove beneficial to herself and to her infant—to the former, by contributing to the contraction of the womb and stopping any tendency to bleeding; to the latter, by communicating warmth.

Another reason why the infant should be in proximity to its mother at this time is that it enables the ventilation of the room to be thoroughly carried out, a matter of the greatest importance to both mother and child. So long as the infant lies in contact with its mother's warm body, there need be no fear of its catching cold. The windows and doors may be thrown open with impunity, if only draughts be excluded and the cold is not excessive. As a rule, the lying-in chamber is kept much too warm, either for comfort or safety.

The mode of dress must be left to the previous ideas of the mother, but a protest cannot be out of place against the "fashion" which prescribes innumerable garments and which, to say the least, entails delay, unnecessary exposure, and fatigue at a moment when each and all of these should be avoided.

It is seldom necessary to have recourse to artificial means in nourishing the newborn infant, though it is sometimes difficult to persuade the mother that the child is not starving. Nevertheless nature has fully supplied all that is necessary for the wants of the child. Small in quantity and comparatively poor in quality as this provision admittedly is during the first two or three days after delivery it is amply sufficient for the purposes of nutrition. Not only is this so but the early secretion has the necessary mild aperient action which enables the bowel to clear itself of the dark contents (meconium) and assist the establishment of normal action. All that is necessary beyond this is a little water between feeds.

Aperients are injurious.—The castor oil which is sometimes administered to the newly-born infant is actually injurious, in that it acts as too rapid and too powerful a purge. It at once removes the whole contents of the intestine, part of which, it is intended by nature, should be absorbed into the blood, to contribute nourishment and heat to the body, pending the full secretion of milk and during that period of rest which is so much needed by mother and child. When castor oil has been wrongly administered, it is almost a necessity that some artificial food be given, because a premature appetite has been created by the removal of nature's provision. Restlessness follows as a matter of course, instead of that complete tranquillity which should be enjoyed. The infant is needlessly subjected to the risks and disadvantages of artificial food at the very moment when it is least fitted for an ordeal by which indigestion, flatulence, and perhaps bowel irritation may be induced. In short, the balance between nutrition and digestion is overthrown by interference, while the probable necessity for the further use of aperients is increased.

During the first twenty-four hours it is not necessary to put the child to the breast more than two or three times.

Section II.—Emergencies at Birth.

All may not go smoothly with the child. There are some accidents which may happen at or immediately after birth, and some unnatural conditions which, with their remedies, we now proceed to consider briefly.

The child may fail to breathe at birth or cease to do so. In such cases prompt measures are necessary but the utmost gentleness must be employed. In the excitement of the moment attendants may unintentionally be rough and so minimise the chances of success.

Still-born babies may be divided into two classes :—

A. Those who appear blue and congested.

B. Those who appear white.

Procedure for blue babies :—

(*a*) Wipe out the back of the mouth, gently but effectually, by a deep sweep of the little finger round which a fold of a moistened soft handkerchief has been passed holding the infant with the head low.

Rapid action necessary.—(*b*) If the child is still attached to its mother, ascertain by grasping the cord lightly between the forefinger and thumb whether there is any pulsation in it. If there is pulsation, do not divide the cord until the child has cried vigorously; for so long as the cord beats, there is some circulation through the child's body, which may serve to maintain life till respiration becomes well established. At the same time dash a little cold water upon the face and chest of the infant, administer a few light but smart slaps, and with the fingers placed upon the lower part of the chest where the ribs separate, give an occasional jerk inwards, removing the hand suddenly each time. Should there be any delay in the commencing of breathing while the child still remains attached to the mother, begin artificial respiration as below described.

Feeble pulsation.—(*c*) If the pulsation in the cord be so feeble as to make it almost doubtful that any exists, and if there are no signs of returning animation, without hesitation put a double ligature upon the cord, divide it between the ligatures, and proceed as directed in the following paragraph :—

(*d*) If there is no pulsation try the effect of passing the finger into the anus, or, in a male, of dilating the foreskin gently with forceps. If this fails, artificial respiration must be carried out until natural breathing starts, keeping the child covered with hot wet towels.

The measures may be summarised as follows :—

1. Clear all mucus from the mouth and throat.

2. Examine cord for pulsation—if present do not divide; if absent ligature and divide quickly.

3. Cold water to face and slap buttocks.
4. Two or three strokes of artificial respiration.
5. Dilate anus or prepuce.
6. Artificial respiration.

Procedure for white babies :—

White babies are in a more dangerous state and require special measures. Gentleness more than ever is necessary. Action to be taken as follows :—

1. Immediate cutting of the cord and ligature. Place the baby up to the neck in hot water tested by the elbow. The water should be really hot and should redden the baby's skin.

2. Clear the back of the throat of mucus, preferably with the aid of a mucus aspirator which may be improvised by a rubber suction ball and catheter.

3. (*a*) If the heart beat is slow, wait a minute or two until the rate increases, meanwhile rubbing the gums with undiluted brandy and then try dilating the anus, to be followed by mouth to mouth inflation of the lungs, but still keeping the baby in the bath. This procedure is carried out as follows :—

Place two layers of sterile gauze over the baby's mouth and blow gently, keeping one hand on the upper abdomen so that the lungs are expanded but not unduly and repeating the process about twelve times a minute.

(*b*) If the colour is improving, the pulse rate rises to 130 and the child still does not breathe, apply cold water to the face and start artificial respiration, keeping the baby warm with towels rung out of warm water.

4. If the heart beat remains slow or is imperceptible inject adrenalin, minims 3 to 5 according to the size of the child, directly into the heart muscle.

5. Should these measures be successful the baby should be quickly dried, wrapped in flannel or cotton wool and placed in a cot with hot water bottles. No attempt should be made at cleaning until it has fully established its vitality. Such babies are better cleaned with warm olive oil and not bathed for the first few days.

Artificial respiration is conducted as follows :—Having cleansed the child's face rapidly and wiped out the back of the mouth, place the infant on its back on the bed, the head being thrown well back, and the chest elevated by a couple of folded napkins beneath the shoulders. An assistant should now draw forward the tongue with his fingers and so retain it between the

gums. Standing behind the head, grasp each forearm, which should be well everted, i.e., turned outwards, the palms looking upwards, and extend the arms upwards till they meet directly above the top of the head, thus causing an indraught of air by increasing the capacity of the chest (inspiration). Then bring the elbows steadily down to the sides again, bending them as they travel, and gently press them against the chest, which will be felt to bend in a little, thus expelling the air (expiration). Repeat these motions with about the rapidity of a child's ordinary breathing, until there is a natural attempt at respiration. As far as practicable, regulate the further movements in concert with the natural efforts which are being made, and do not desist till the respiratory function is properly established, and the child cries lustily and persistently. See also that you do not perform the movements too quickly or let the babe's body get chilled. This is prevented by frequently immersing it in warm water or covering with hot towels.

Efforts at resuscitation should be maintained for some time, at least for half an hour in spite of no evidence of success.

Accidents and abnormalities.

1. *Swellings of the scalp* are not infrequently observed in the newly-born infant, and may occasion alarm. They are soft and puffy, and are caused by the pressure endured at birth. No treatment is required as a rule. These swellings are unimportant, and will generally subside of their own accord in a few days.

2. *Bleeding from the navel-string* is to be treated by the application of an additional stout ligature placed a little nearer to the body than the first one.

3. Should an infant appear to be ***unable to suck,*** it may be that the infant is too weak, or premature, or that it has a cleft palate or tongue-tie. Should there be no immediate possibility of obtaining medical aid, the infant must be fed by means of a spoon with its mother's milk, or, if this be not obtainable, with fresh cow's milk ($\frac{1}{3}$) and warm water ($\frac{2}{3}$) to which a little sugar has been added.

Very few children are really ***tongue-tied.*** Do not therefore too quickly jump to the conclusion that such is the case simply because an infant does not readily suck.

It may be concluded that the tongue is tied down when that organ cannot be raised from the floor of the mouth by passing the little finger underneath it; when the string is seen to extend nearly to the tip of the tongue; and when, the infant attempting

to suck, the milk flows down the breast without entering the throat. A small and simple operation will correct this condition.

4. Should the bowels not be moved within the first twelve hours of life, *examine anus* and gently introduce the little finger smeared with vaseline. Should it be found, as happens rarely, that there is no opening surgical aid must be sought promptly.

5. An infant may be born with a *cleft palate;* that is, the roof of the mouth is split from behind forwards. This condition requires great attention in the matter of feeding; there is not the slightest use in giving the child the nipple, or in attempting to use the feeding-bottle in the ordinary way. The child cannot suck; if it attempts to do so, the milk will get into the nostrils instead of passing into the stomach. Artificial feeding (Chapter V) must of necessity be adopted, using a feeding-bottle, a piece being cut from the side of the nipple sufficient to make a circular opening about so large (O); the child should then be placed in the semi-erect posture, the bottle, about half full of the food, being at hand. The nipple should now be placed in the mouth, and the end of the bottle suddenly tilted up. Of course, the result will be a gush of milk down the throat. Almost instantly the end of the bottle is to be again lowered, and after a few moments' interval re-elevated, and so on. The feeding is to be conducted by a series of jerks. A spoon may be used, but it is troublesome and not nearly so effectual. The normal leech-bite at the top of the nipple should be closed with rubber-tyre solution.

An ingenious contrivance, which may be obtained from an instrument maker or easily made from a portion of a rubber glove consists in attaching to the stalk of the ordinary nipple of the feeding-bottle an elastic flap cut to fit the palate. During suction this is forced back and forms an artificial palate, which prevents the fluid from entering the nose and enables the infant to suck.

By such means an infant with a cleft palate may be thoroughly nourished and kept in good health till babyhood has passed. Afterwards, there will be no difficulty, and at two years of age the surgeon will be able, in the majority of instances, to remedy the defect, and even the age of six months is not too early for operation in some cases.

Section III.—After the First Day.

The first day of the child's life having been conducted in the way described, and the mother having assumed her natural

office, the subsequent general management of the infant should be as follows:—

It has been said that the first washing may be hastily performed, but subsequent ablutions must be thorough and daily repeated. The word "ablution" is used advisedly in contradistinction to bathing, for the child ought not again to be plunged into the bath till the navel-string has become detached, the object being to preserve the string from contact with moisture, which in India will cause it to smell abominably; besides which, moisture has the effect of prolonging its retention for some days. If the string be perfectly protected from water, it will soon become hard, dark-brown coloured, as dry as a chip, without the faintest odour, and it will usually fall off on the third day. It is a good plan to sprinkle the dry and shrivelled cord with a little zinc and boric acid dusting powder, or wrap it in boracic gauze or wool. It is most important to keep the cord sweet and dry.

An infected cord is the source of the greatest danger to the child, especially in India where septic infection, to say nothing of tetanus, is so prevalent.

The infant should be suckled three or four times on the first day and at intervals of four hours on the second day, after which it should be nursed regularly every third hour during the day, and once during the night for the first month; and no accessory except water should be given.

We append a table of breast feeding on page 21 which should be scrupulously followed both for the sake of the mother as well as for the child's health; though it must be admitted that *many children thrive excellently from the first on four-hourly feeds* (*see* Chapter IV).

Habits of regularity must be established early and a plentiful amount of sleep for the infant ensured, with rest and quietness for the mother and when once the infant has learned to take the breast well and is nursing vigorously and gaining in weight, anxiety will cease.

The bowels will probably be relieved three or four times each day. On the second day, the evacuations will become of a yellowish colour, the black matter having been for the most part purged off by the first milk; but whether this be completely so or not is a matter of no importance. In very exceptional cases, where the mother's milk does not possess the requisite aperient properties, it may be advisable on the third day to allow half a small egg-spoonful of castor oil mixed with warm water, to which two grains of bicarbonate of soda have been added. By

this time the conditions which before rendered a purgative directly injurious will have passed away.

It may here be reiterated that during the whole course of a human life there is no period at which thorough ventilation is so much needed, and is of so great importance to vitality (both of mother and child), as it is during these early lying-in days. The early removal of all fouled linen and evacuations of both mother and child is a matter of much importance, and one which, if neglected, is calculated to effect very injuriously the health and life of the child, more especially in small apartments. There are certain diseases to which the infant is liable under insanitary conditions, particularly in a hot climate, during the first ten or twelve days of its existence, which are known to be the direct effects of foul air and dirt; for instance, the native infants of Calcutta die largely from lock-jaw (tetanus), an almost hopeless condition, which is all but unknown among the European infants of the city, and which is the direct product of dirt, foul air, and insufficient ventilation.

Warmth is still essential to the infant's well-being; it must not be the warmth of foul air, but the imparted heat of the mother. Foul air will not impart heat, nor will fresh air cause colds or chills. Foul air is at this time a most effectual poison; fresh air conveys life and health, and by increasing the vitality, greatly helps to augment the production of natural internal heat.

Jaundice.—Very frequently an infant's skin becomes of a *yellowish colour* about the third or fourth day of its life. The coloration may deepen for a day or two, and then it will as gradually subside. This condition is not one of real jaundice, but is due to the changes which the blood is undergoing in the over-congested skin and is of trivial importance. The process of clearing may be accelerated by giving pulv. hydrarg. c. cretæ. gr. ¼ to gr. ½ daily, plenty of water to drink and when feasible, sun-baths. There are, however, forms of jaundice of serious import which occur within a few days of birth.

Sometimes the *breasts* of the infant enlarge four or five days after birth. A small quantity of milk is secreted, and can be squeezed from the nipple. The occurrence is as frequent in males as females, and may continue for some weeks. In almost all cases, if left alone, subsidence will take place gradually, without giving any trouble; but if squeezed or pulled about by an ignorant person, inflammation and even abscess may be caused.

Vaginal discharge.—A slight bloody discharge from the vagina of a newborn female infant is generally of no importance, and will very soon cease.

The napkin may show flecks or stains of bright red, which may be mistaken for blood in the urine. This is a natural deposit and need cause no concern.

The *limbs* should be examined for any weakness. Sometimes it is found that an arm or leg is immovable or distorted. Though in many instances such conditions pass off, professional advice should be sought.

Neck swelling.—A hard swelling in the neck about the size of a cherry, is occasionally met with and noticed a couple of weeks after birth. It may cause the infant to bend the head to one side, and has probably been caused by stretching or even tearing of the muscle which goes from the top of the breast-bone to behind the ear. In the great majority of cases it disappears with time.

Foreskin.—In male children the foreskin may be excessively long and the aperture so small that there is obstruction to the passage of urine. Such a condition may give rise to screaming fits, restlessness or even convulsions. In addition, any tendency to hernia will be exaggerated.

In minor conditions it will suffice to dilate gently the aperture with dressing forceps, retract the foreskin and separate from the underlying glans.

In more severe cases some slight operation is necessary. It is not advised that circumcision be performed in all cases but sufficient skin should be removed to enable the remainder to be retracted without difficulty.

Rupture in the infant is a protrusion of a small part of the abdominal contents through an ill-developed part of the wall to form a swelling visible under the skin. The commonest sites are at the umbilicus and in the groin (*see* Chapter XII).

Umbilical hernia.—The soft round swelling which is apparent at the navel subsides when the child is placed on its back, but reappears during crying or strain of any sort. The protrusion may be reduced by gentle pressure with the fingers. There is no pain of any kind. The domestic management of this condition is simple (*see* page 125).

Inguinal hernia.—All swellings in the groin must be submitted for professional diagnosis. Once rupture or hernia have been diagnosed attempts should be made to prevent protrusion by the application of a woollen truss or, failing this, of a truss made to fit infants.

Undescended testicle.—Again, it is not uncommon to find one or sometimes both testicles undescended. In most cases,

nature rectifies this within the first year. But if this does not occur or one fails to descend, surgical advice should be sought.

Birthmarks.—Dark wine-coloured stains are unsightly but the mother may console herself that if not too extensive they may be removed by treatment.

CHAPTER IV.

BREAST FEEDING.

PRELIMINARY REMARKS.

It is the duty of every mother to feed her own baby and even in this country, with due care, breast feeding may be carried out for five to six months without undue exhaustion. Those who have had the opportunity of comparing breast-fed with bottle-fed babies will need little convincing as to the superiority of the former method. Though it is possible to feed babies from birth by artificial means, there is no true substitute for the mother's milk. Approximately 90 per cent. of the diseases of the digestive system occur among bottle-fed babies, not only from the difficulty in avoiding contamination, but also because the mother's milk contains the constituents in the proportions most necessary to the well-being of the child in an easily digestible form. We may imitate the proportions, but we cannot attain the actual physical and chemical qualities of the natural food. The final and most convincing argument is experience with delicate babies, some of which, after trial of the various forms of artificial feeding most skilfully controlled, will only thrive when put on breast milk. In addition, the mother's milk possesses a certain power of conveying immunity to disease apart from its virtues as a food and this cannot be replaced by any artificial means.

The child should be put to the breast at least six-hourly during the first twenty-four hours. This practice will do much to encourage the flow of milk and prevent discomfort from distension of the breasts.

In certain sections of the Indian community there is a persistent tradition that the child should not be put to the breast until the fever, sometimes associated with the first few days after birth, has entirely subsided. There is nothing to be said in favour of this practice; indeed experience shows that the effects are definitely harmful and that the primary object is defeated as the unrelieved breasts cause a persistence of the fever and are often the sites of inflammation or even abscess formations.

Care of mother.—We have never known injury to be inflicted upon a mother's breast by the application of her infant before the white milk was to be seen; or as soon after birth as possible. The mother should not partake of much fluid till the sense of distension of the breasts has passed off, but when the infant has been sufficiently early applied, there is seldom any trouble on this

score. The relief of her bowels daily, by the assistance of simple warm water injections, will materially tend to lessen the likelihood of such an occurrence; it may, however, be sometimes necessary to employ fomentations and gentle frictions, aided by oil, to relieve a painful hard breast. The frictions should be very lightly performed, the hand barely touching the skin when passing from the nipple towards the edge of the breast, but being pressed with gentle firmness when travelling in the opposite direction.

The first essential of successful feeding is absolute regularity in the time. On this depends both the health of the mother and of the child and the maintenance of the milk supply. Irregular or overfrequent application to the breast weakens the mother, interferes with her rest, leads to the secretion of a poor quality of milk and induces indigestion in the infant. Uneducated mothers are tempted to put the child to the breast whenever it cries with the result that everything goes wrong. The infant does not learn habits of regularity, sleep is disturbed and he whines and whimpers, not from hunger, but from fretted nerves and indigestion. The milk becomes of poor quality and the condition of the infant deteriorates steadily.

The diet of the mother.

With regard to the diet the mother should take, very few restrictions may be made. It is desirable that she shall eat the ordinary mixed diet of health, avoiding articles obviously indigestible, such as curried or highly spiced foods, large quantities of meats and uncooked vegetables. Tinned foods of all forms are undesirable in that they have not the necessary vitamin content. Fresh vegetables, including potatoes, fresh meat and fresh fruit are an essential part of the diet. A nursing mother does not differ from the rest of humanity as to the laws which govern the physiological process of nourishment, and these declare that if fresh vegetables be excluded, or even very sparingly partaken of, a scorbutic taint of the blood is engendered, which impairs, more or less, the general health, unfitting the mother for suckling and rendering her milk unwholesome for her infant. Many times by following this advice, a mother who never before had done so, because she had previously held fast to the theory of the necessity for excluding vegetables, has been enabled to nurse her child, with perfect health to herself and infant. With such an unfortunate conviction is allied another, namely, that it is essential during nursing to consume a considerable proportion of beer or wine. It is alleged that milk is thus created, and the drain of nursing upon the system is urged as a

reason for the necessity of "support". Spirituous liquids do not lead to the formation of milk in any degree whatever, and their use in no way compensates for the lack of a proper admixture of food in the diet; nor is it true, that nursing is a drain upon the health of any moderately healthy woman—on the contrary, it is known to be beneficial, and that women generally improve in health during its progress. A nursing mother requires, it is true, more fluid than others. She is frequently thirsty. To relieve this thirst, she should drink gruel or barley-water, or milk and water, which, besides being drinks, are really nutritious, and therefore milk-forming. Thorough nourishment of the system is certainly demanded, but she does not need stimulation, which may render her feverish and cause the milk to deteriorate. The usual glass of wine, ale, or stout need not be denied at dinner-time and also at tiffin if desired, but such an allowance is ample; more is injurious.

Menstruation during suckling period.—Should a mother happen to menstruate during the suckling period, it is an unfortunate occurrence; but it is not one which should prevent her continuing to nurse, unless the ordinary period of weaning be at hand. Usually, the infant, during the days the function continues, will show some signs of indisposition, generally slight, but which, if at all severe and recurring, proclaim the mother unfit to continue her office; otherwise it is unnecessary that she desist.

GENERAL INSTRUCTIONS ON BREAST FEEDING.

(1) An infant should not receive its nourishment lying down. The semi-erect posture is the proper one to adopt; exactly that position in which a mother naturally places her child when she sits in a chair, nursing. The muscular power of swallowing is, in the infant, very feeble, but by the semi-erect position we avail ourselves of gravitation; the child, when so placed, actually obtains more nourishment, and the apparently causeless rejection of milk is then less frequent.

(2) A time table should be laid down on the principle below :

BREAST-FEED TABLE.

Age.	Numbers of feeds in 24 hours.	Interval.	During night.
1 month	7	3 hours	1
2—3 months	6	3 "	0
4—5 "	5	4 "	0
6—9 "	4 or 5	4 "	0

(3) Night feeding should be reduced to a minimum, in fact with most healthy babies if the last feed is given late, say at eleven P.M., they will sleep undisturbed throughout the night, possibly wanting only a little water.

(4) See that the nipples are kept scrupulously clean before and after each feeding and see that the baby's mouth is kept clean.

(5) Place the baby to each breast for seven minutes three-hourly, but the time is varied according to the vigour with which the child sucks and according to the readiness with which the milk flows.

(6) The mother is to avoid constipation and drink a whole tumbler of water before each feed is due.

(7) She should not worry or take to excess those things which are credited with special powers in promoting the flow of milk, i.e., cotton seed, large quantities of milk, sago and the like which only cause constipation. The best stimulant to a good flow of milk is a hungry infant fed at regular intervals.

(8) Each breast should be hot and cold sponged for a quarter of an hour twice daily and gently massaged from the side to the middle twice daily. The mother should rest in bed for two hours a day.

(9) Weigh the baby regularly before and after each feed for a few days and from the difference in the two you will gather the amount actually taken and further will be able to judge that the quantity throughout the twenty-four hours is within the normal requirements. The actual requirements will be approximately 2¼ ounces to each pound of the child's weight in the twenty-four hours; thus a baby weighing seven pounds will require approximately 16 ounces in the twenty-four hours. Should the quantity taken be definitely in excess of requirements the time should be shortened and should the amount be less than that required, it may be necessary to supplement the feed with artificial substitutes (*see* Chapter V).

In spite of the greatest care failure sometimes occurs. The main causes are :—

(*i*) Excessive worry and nervousness on the part of the mother.

(*ii*) The milk may be scanty from various causes, such as deficiency in diet, an excess or lack of a proper amount of exercise and fresh air. The mother must realise that during the period she must subordinate her own routine to the business in hand and that it will not be possible for her to carry out her usual

avocations, possibly with excessive social demands and at the same time successfully feed the baby. Periodically there is considerable difficulty in starting the flow of milk. In such cases hope of breast feeding should not be abandoned but pending the establishment of a satisfactory flow, supplementary feeds may be given (*see* below). Special attention should be paid to the hygiene of the mother (*see* para. 8, "General Instructions").

(*iii*) The milk is sometimes too rich. In such cases the mother should regulate her diet in amount and exclude an excess of fatty food, drink more water, and may further modify the richness by giving the infant one ounce or more of sweetened water before the feed. On the other hand the milk may be too poor and watery, though abundant. In such cases the child constantly demands the breast because he is always hungry, but may reject it after a few minutes. He fails to gain weight and is frequently constipated. It will be necessary again to alter the mother's habits by increasing her diet, giving malt extract or other food tonics and increasing the hours of rest.

(*iv*) The mother may take medicines which are secreted in the milk and upset the child. Some forms of purgatives, particularly aloes and cascara, may cause griping and diarrhœa in the infant; liquid paraffin or Agarol have no such effect. Most drugs have very little effect on the infant, but alcohol as such has been recorded as seriously affecting the infant.

(*v*) The nipples may be so retracted as to present a serious difficulty. Attention should be paid to this point during confinement and the nipples gently and carefully drawn out. Sometimes the use of a nipple shield will overcome the difficulty. This shield may also be used in case of sore or cracked nipples.

The cause of failure may lie in some inherent defect in the child. The digestion may be very weak and is incapable of dealing with the milk which may be relatively too rich or which flows too quickly. The child may be a "bolter", that is to say he sucks vigorously and violently and swallows the feed too rapidly. In rare cases the milk definitely disagrees and the infant becomes fretful and liable to colic, rest is disturbed and there may be vomiting or diarrhœa. In such cases we adopt the plan of giving water in a bottle before the feed. If the child be a bolter the simple expedient of supporting the breast at the base and compressing the nipple with the fingers will retard the flow.

Investigation of failure.

The first step is the estimation of the actual amount taken by weighing before and after the feeds. This should be carried out throughout the twenty-four hours as the amount taken at

different feeds may vary considerably. The test is to be carried out, not only in the case of sickly infants, but also in those thriving, in order that the feed may be adjusted to the correct amount and the well-being of the infant thereby maintained. The weighing must be done on scales accurate to ¼ or ½ an ounce. It is not necessary to undress the baby. Weigh him as he is, just before and just after successive nursings, noting the difference each time; at the end of the day the mother knows exactly what quantity of milk has been withdrawn from her breasts; and hence, if need be, the necessary supplementary bottle allowance. Of course, if health and growth are normal, the milk supply cannot be far wrong. *A trial of the simple expedient of weighing the baby before and after suckling, and adjusting the feeding accordingly, proves conclusively that many mothers give up breast feeding quite unnecessarily.* In the vast majority of such cases the breast supply is merely inadequate, and when the shortage has been ascertained and rectified, everything goes well —the sole need being to *make up the deficiency of breast milk at each feeding. If there is indigestion, putting up of food, restlessness, disturbed sleep, or any other sign of ill health or discomfort—especially if a baby is not growing properly—the first thing to do is to weigh before and after feeding.* Without such weighing any attempt at treatment is mere guess-work.

As stated above the average requirements for a healthy baby are 2¼ ounces for every pound of body weight in the twenty-four hours. This figure is approximate for the cold weather, but in hot weather it will be markedly lower approximating 1¾ ounces per pound. The same or a greater quantity of fluid may be required which may be made up by giving water between the feeds.

Supplementary feeding.

If, after careful observation of the child's weight before and after meals, there is evidence that the breast milk taken is insufficient for the needs of the infant, and if this is further confirmed by the demeanour of the child and a failure to gain weight, two lines of action are indicated. The first is to raise, by all means in our power, the amount of breast milk, and it may be stated with confidence that such an object may be accomplished in the majority of cases without great difficulty. The second, to make up the deficit, by means of addition to such feeds as are not adequate.

The method used should be such as to continue the stimulus to the secretion of breast milk, so that no reduction should be made in the number of breast feeds. In practice it will be found

that it is usually the last two feeds of the day which show a marked deficiency. By subtracting the amount taken, ascertained as detailed above from the calculated requirements, the amount to be replaced is found. The most suitable substitute is fresh cow's milk diluted with water but it is not wise to make use of full strength milk at one step. The standard must be approached gradually, starting with milk and water in equal proportions, with sugar of milk added in the correct proportions (*see* Chapter V). Gradually the breast milk will have been amplified, so that the amount of the supplementary feed will become proportionately less. Special care should be taken that the nipple of the feeding bottle offers resistance to sucking. If the infant experiences an easy response to his suction, there is danger that he may refuse to make the necessary effort when put to the breast.

Contra-indications to nursing.

There are certain conditions and diseases which render the mother unfit to suckle the infant. These may be summarised as follows :—

1. Severe debility such as may be caused by tuberculosis, diabetes, severe anæmia, serious heart disease or nephritis.

2. Acute septic infections, such as blood poisoning, puerperal fever, or pneumonia.

3. A mother who is subject to epilepsy or other violent paroxysmal nervous disorders should not nurse, both for her own sake and that of her child.

4. Abscesses of the breast.

5. The occurrence of pregnancy is opposed to good nursing. The quality of milk then greatly deteriorates, the mother's system not being able to nourish both the babe at her breast and that in the womb at the same time.

INDIGESTION AND DIARRHŒA IN BREAST-FED INFANTS.

Early and prompt treatment is most necessary. Analysis of the breast milk and infant's stools proves that in 70 per cent. of the cases excess of carbohydrate or fat is the cause and, of the 30 per cent. remaining, 25 per cent. of these are due to excess of protein. The main causes are lack of attention to the rules. If, in spite of due care, signs of indigestion and diarrhœa supervene, feeding must be regulated by reducing the length of time during which the baby is at the breast. Drugs play a very secondary and unimportant part in the treatment of these disorders and should only be used when necessary after feeding has been carefully regulated.

Treatment :—

1. In the early stages reduce the timing at the breast and give water from a bottle ½ to 1 ounce before each feed, if necessary sweetened with a little milk sugar.

2. Between the feeds give water freely as much as desired, making it palatable with a fractional quantity of saccharine.

3. In severe cases stop temporarily all feeding and give instead whey, remembering that the stomach of an infant over six months will not hold a greater quantity than 1 ounce over its age in months.

4. For the frequent small, green, slimy stools, a warm saline enema is often most useful, given with a soft catheter and funnel.

If the buttocks are scalded, equal parts of zinc oxide and castor oil applied will allay the soreness.

5. If the condition is a green lienteria, that is, if the infant's bowels are moved immediately following its feed, 1 to 3 drops of tinct. camph. co. before each feed will be found useful.

THE PREMATURE BABY.

The rearing of an infant to any marked degree premature is fraught with the greatest difficulty. The infant is deficient in vitality, the natural functions of the body are not fully developed, it is unable to maintain the natural body heat and it is peculiarly liable to infection. The problems therefore which face the attendant may be summarised as follows :—

(1) There is a tendency to undue loss of body heat. There is a general lack of vitality, the heart is weak and the lungs tend to be incompletely expanded.

(2) There is an added tendency to hæmorrhage due to brain or other birth injuries.

(3) All the functions of the body are not fully developed and the digestive system in particular is not adequate to meet the demands made on it.

(4) Breast milk, the ideal and in many cases the only possible form of nourishment, is often delayed or insufficient to meet requirements.

(5) There is a higher liability to infection than in the normal child.

To overcome these defects we adopt the following measures:

(1) Loss of heat. The baby is not bathed, but is cleaned quickly with warm olive oil and wrapped subsequently with cotton-wool. In the case of very feeble infants it is wise not to attempt

to remove vernix (white waxy deposit on the body) completely and the oiling should be carried out once every two or three days only. Unnecessary handling should be avoided. Warmth should be maintained by hot water bottles or suspended electric lamps with the object of keeping the air around the child between 85° and 90°F. Screens may be arranged to prevent draught and maintain a constant temperature. Our aim is to keep the rectal temperature of the child between 99.2° and 99.5°F. Caution is necessary in the hot weather lest by too active application of these principles the infant's temperature be pushed to an undesirably high degree.

(2) General lack of vitality and increased tendency to hæmorrhage. The utmost gentleness is exercised in handling, the head is carefully supported and in the case of very feeble infants they are not lifted from the cot at feeding times. At the same time, the infant should not be left too long lying on one side, it is wise to turn it over gently every two hours so that each lung may have a chance to fully expand.

(3) Partially developed digestive system combined with a necessity for nourishment in excess of the normal. It is essential that the amount of fluid taken in the twenty-four hours in hot climates should not fall below an amount equivalent to one-fifth of the body weight. If the amount falls below one-seventh, the child will assuredly die. Very few premature babies in the early period of life will take this quantity of breast milk, so the fluid must be amplified by giving water.

As regards feeding, the following figures form a sound basis in number and intervals of feeding. For the first twenty-four hours one teaspoonful every hour and every day gradually increase the amount and the interval so that at the end of the week the baby is taking half an ounce every two hours during the day and every three hours during the night. The amounts, therefore, will be, first day, 1 ounce of breast milk or its equivalent for every pound of the infant's body weight during the twenty-four hours. By the fourth day the amount has been raised to 1½ ounces, by the tenth day the amount will be 2 ounces per pound and so gradually to 2½ ounces, which is to be regarded as the optimum amount for hot climates. It will be necessary to wake the baby for the feeds as the premature baby, unlike the full-time baby, tends to sleep all the time and does not wake when hungry. The ideal or most essential food for infants is breast milk; without this food the number of failures is greatly increased. Every effort must be made to increase the mother's milk, though in spite of adequate measures there is often delay in appearance and the quantity is persistently low. In hospitals

it is sometimes possible to obtain additional milk from some mother who is in active lactation; otherwise, supplementary feeds must be given. The supplementary feed will be administered on the principles laid down in the next paragraph.

Artificial feeding.—The same rules as regards timing and amount are observed.

Choice of food.

(*i*) Milk diluted into two parts water to which milk sugar is added in proportion of one ounce to a pint.

(*ii*) Lactic acid milk (*see* Chapter V) or Lacidac one-half strength to which has been added ¼ teaspoonful of milk sugar to each ounce.

(*iii*) Peptonised milk half strength to which is added ½ teaspoonful of sugar and with advantage 2 drops of lactic acid, B. P., to each ounce.

Of the three, No. (*iii*) is the most easily digestible, but is somewhat difficult of preparation.

Method of feeding.—It is to be remembered that small premature babies have a very poor power of suction and that further it is highly undesirable that they should be removed from the cot at frequent intervals. For this reason, until the baby has developed some vigour, the milk should be drawn off with the breast-pump aided by massage and administered to the baby with a pipette. Several types of useful feeders are on the market.

Finally, the infant must be carefully guarded against infection. Only those immediately concerned should approach the cot and especially should those suffering from catarrh, sore throat or pyorrhœa be kept away.

It is of course important to have some criterion in mind from which we may form an opinion as to the suitability of the diet. Feeding beyond the capacity of the child will produce restlessness, a tendency to distension of the abdomen with gas, a blue discoloration round the lips, vomiting and diarrhœa. The underfed infant also will be restless and constantly wailing, the face will be pinched, there will be a tendency to constipation rather than diarrhœa, the abdomen will be retracted instead of distended and again the child will show a blue discoloration round the lips or even over the whole face and body.

Three other points must be mentioned :—

(*a*) The premature infant is born without that reserve of iron stored in the liver which carries the full-term child through the period of lactation. Anæmia is therefore liable to appear at

about the end of the third month and must be corrected either by giving a small quantity of vegetable soup daily or by the administration of some easily absorbed form of iron. Hæmolac, a dried milk powder to which iron has been added, prepared by the Cow and Gate Company, makes an excellent food at this juncture, or 5 to 10 drops of a solution of ferri et ammonii citrate (one grain to one drachm) may be added to each feed.

(*b*) The premature child is especially liable to develop rickets. As soon as the diet is fully established some form of concentrated vitamins such as Ostelin, two drops a day, should be given. Fresh fruit juice, preferably in the form of orange juice, one teaspoonful a day should also be given to provide the anti-scorbutic factor.

(*c*) The premature infant has little or no resistance to infection, so that it should be guarded with especial care. Special care to the umbilical cord should be given and no one with catarrh should enter the room. No one should breathe over the child.

CHAPTER V.

ARTIFICIAL FEEDING OF INFANTS.

There is danger that this chapter, containing as it does, minute description of the artificial feeding of infants from the earliest age, may be misconstrued into an advocacy for the abandonment of natural methods. Such is not the intention. Artificial feeding in the early months is sometimes inevitable but *if the mother is able to feed the child naturally until it is time for him to abandon the breast for other foods, he has the inestimable advantage that his digestion has never been tampered with and he has been supplied with the ideal materials for building up the body. The child fed to the full natural term has a five times greater chance of surviving the first year of life, and in the case of a delicate child, the balance is even more heavily weighed.*

There is no perfect substitute for breast milk. There is no other method of feeding which will do as well and, though the results of careful artificial feeding are usually satisfactory, it cannot be fairly stated that the baby is not handicapped. The story of a sick child, heard only too frequently, is that so long as the child was breast-fed, progress was satisfactory, but that as soon as bottle-feeding was started, the child showed its delicacy.

The younger the child, the greater the difficulty; the digestive powers, like the other functions of the infant, are in an embryonic state at birth, they develop slowly and allow little margin for error, especially during the first few months.

The digestion of the infant is attuned to one form of food, the requirements are accurately provided for by nature and it follows that, if the infant is called to digest food of a different form and build up the body from materials in different proportions and quality, he is starting at a disadvantage. For the substitute food, we depend on cow's milk in some form. Other forms of food, save in exceptional circumstances, are absolutely inadmissible before the age of nine months.

The relative proportions of human and cow's milk are as follows :—

	Protein. Caseinogen.	Whey protein.	Fats.	Carbohydrates (milk sugar).
Human average percentage.	.5	1	4	7
Cow average percentage.	3	.5	4	4.5

	Mineral content.	Cholesterol.	Lecithin.
Human	.18—.28	.476	.058
Cow.	.6—1	.351	.048

The importance of these differences is now for consideration.

Protein.—There are two main varieties of protein in milk, whey protein which is soluble and easily digested, and caseinogen which forms a tough clot under the influence of gastric juice and is, in consequence, less easily digested. A certain proportion of whey protein is essential to growth and one of the great difficulties of artificial feeding is to dilute the caseinogen without reducing the whey protein below the minimum required. The whey protein, like all other proteins, is split up into bodies of smaller molecular weight, the amino acids; each type of proteid produces its own amino acids, and there is reason to suppose that a certain proportion of the whey proteid derivative is essential to the building up of human tissues and cannot be replaced by derivatives of other proteids. There is, in fact, a certain specificity and each variety of proteid in milk is specially suited to the young of the animal which produces it.

If cow's milk be given whole, the content of the whey protein is sufficient, but the coagulating proteins are greatly in excess, not only do they tax the digestion to the utmost, but in the process of splitting a number of poisonous bodies are formed, which have to be dealt with by the liver and kidneys with a risk of strain to these organs.

Fats.—There is little difference in quantity between the fat content of average human and cow's milk, but there is some difference in the form of the fats and in the fineness of the emulsion, which may account for the fact that many infants are unable to tolerate the same percentage when fed on cow's milk and *that fat indigestion is the commonest form of infantile dyspepsia.*

The *carbohydrates* of cow's milk are low in quantity, but the deficiency can be corrected and sugar of identical composition added.

The *mineral salts* are in sufficient quantity even in dilution, but the iron content is low.

Lecithin.—The lecithin content is low, but though present in minute quantities in either, it is an important constituent of brain tissue, and the fact that human milk contains a much higher proportion, suggests that it is there for some good purpose.

Cholesterol.—The function is as yet not clear, but there is evidence that cholesterol is intimately connected with vitamin retention.

Vitamins are present in adequate quantities in the milk of the pasture-fed cow, but it is to be remembered that they are vulnerable and likely to be reduced or destroyed by measures usually employed in the preparation of milk and depend to a considerable degree on the diet and hygiene of the cow.

Immune bodies.—There is little question that the mother is capable of imparting some of her acquired immunity to disease to her child through her milk. These immune bodies form a valuable safeguard to the child which is forfeited if the child be fed on other food.

It will be seen therefore that cow's milk has a number of marked differences from human milk, and that the task of feeding a baby artificially is by no means easy. However, in spite of all these objections, which have been stressed advisedly for the benefit of the more delicate infants, thousands of children have been brought up with every appearance of success by artificial means, though it must not be forgotten that thousands have suffered, some from their inherent inability to cope with substitutes, and many from want of care in the substitution.

Before embarking on the delicate task of changing from natural to artificial feeding, the mother or attendant must have a clear plan outlined and the following matters are for decision:

1. The choice of food.
2. The method of preparation.
3. The amount of food required in the twenty-four hours.
4. The capacity of the child's stomach, that is to say, the size of each feed.
5. The optimum interval between each feed.

Choice of food.—The best substitute is fresh cow's milk, modified or diluted according to the digestive capacities and needs

of the infant. Cow's milk must conform to certain standards. It must be clean, for there are many sources of contamination, the milker's hands, dirty vessels, vessels washed with polluted water, dirty udders of the cow. The danger of transmitting tuberculosis from an infected cow to the infant is a real danger and it must be remembered that a high proportion of the tuberculosis of infancy is bovine and may be attributed to milk-borne infection, though this danger in India is not so great as in England. Dirty milk, even if boiled, is still dirty, and the swarms of dead bacteria may set up intestinal irritation. In India to-day, owing to the difficulty in obtaining milk up to standard, dried milks such as Cow and Gate or Glaxo are extensively used with excellent results.

Of the physical properties, the fat content is most liable to variation. A series of analyses kindly supplied by Lieut.-Colonel A. D. Stewart shows that the fat content of the milk of individual cows varies as widely as from 3.7 to 6.9 and that in the cold weather the figure is generally higher. It is desirable, therefore, that the fat content of the milk chosen should be known.

The milk must have a good vitamin content. This will depend on the surroundings and feeding of the cow. The investigations of Dr. E. M. Luce into the effect of feeding and sunlight on the vitamin content, that is to say, the *antirachitic and growth promoting factors in milk, have peculiar application and importance in India.* Both are poor when the cow is fed on dried fodder so that it is inconceivable that milk from the cow of the plains in the hot weather can be efficient in these properties. Two sources of supply are available in India. In large centres there are well run dairies under careful supervision, supplying milk of standard quality. There are those who prefer to keep a private cow, in which case the welfare of the animal must be carefully guarded. The cow should be inspected periodically by a veterinary officer.

Goat's milk.

In many parts of India, the milk of goats is used with success as a substitute for cow's milk. The goat is easily kept in the compound, and milked under supervision, but special care must be taken to frustrate its natural tendency to promiscuous feeding. The animal being less subject to tuberculosis than the cow, the milk may be given unboiled should circumstances demand.

The milk has approximately the same proportionate contents as cow's milk and is used in the same way, modified or diluted to suit the individual.

It will, of course, not be used where there is any suspicion of the existence of undulant fever.

METHODS OF TESTING MILK.

The litmus test.—Cow's milk, absolutely fresh, is amphoteric, that is to say, the test paper does not change colour when dipped. After a short while, the milk is rendered slightly acid by the action of certain harmless bacteria, constantly present in milk. This will cause a blue litmus paper to turn red, but is no contra-indication to use. *Alkalinity, that is to say, the turning blue of a red litmus paper is a sign of disease of the cow, or deliberate adulteration with drugs.*

Cream test.—Into a six ounce medicine bottle marked off into half ounces, milk to the quantity of five ounces is introduced. This is allowed to stand on ice for 24 hours. At the end of the time the cream has risen to the top and should occupy at least three-quarters of the top division (Pritchard).

It is hardly necessary to add that, where available, an accurate laboratory analysis of the milk and estimation of the cream content is preferable.

Dirt.—Into a conical white vessel or funnel, ten ounces of milk are introduced and allowed to stand on ice for a few hours. After pouring off the milk there should be no evidence of dirt in the sediment left at the bottom (Pritchard).

The specific gravity test.—This test is carried out by means of a hydrometer. The milk to be tested should be at a temperature of about 60°F.

Pure milk will mark about 30
Milk diluted with 15 per cent. water 26
„ „ „ 20 „ „ „ 23
„ „ „ 35 „ „ „ 18

At the same time milk rich in cream gives a lower figure, so that, if by the cream test, it is found that the cream content is high, a lower figure on the hydrometer is no indication of dilution. The converse, a milk poor in cream or skimmed milk, will give a high figure and may do so even in the presence of added water.

METHODS OF MILK FEEDING.

The question now arises as to the form in which the milk is to be administered. *For the healthy child there are three methods*

of feeding with cow's milk, the whole milk method, the method of adding water in gradually decreasing proportions according to the supposed digestive capacity of the child *and, finally, the method of physiological feeding advocated* by Dr. Eric Pritchard, the proportions in the feed being brought as near to that of human milk as is possible.

Whole milk feeding.—There are still advocates of the whole milk method, their advocacy is based on two not very convincing grounds, the first, that it is impossible, by any form of modification, to produce a substitute really comparable to human milk, and the second, that the majority of infants do well, and that those who do not, must be placed in the category of delicate or difficult infants. It is true that many infants rise to the occasion and manage to thrive in spite of this rather drastic method, but in India the infant has much to contend with, and we cannot afford to add to his burden for we do not really know how far the seeds of disease in later life may be sown in early infancy by incorrect feeding. The graver defects will produce immediate results such as rickets and indigestion, but, of the more remote effects, it is not possible to speak definitely. This being the case, *we are not in a position to take liberties with the nutrition and digestion, and a food cannot be pronounced absolutely satisfactory merely because there is no immediate protest.*

Two methods therefore remain. The first, the method of dilution whereby the protein content is reduced to a figure within the digestive capacity of the infant, the fat is reduced and the sugar is brought up to or higher than the original content by the addition of sugar of milk or cane sugar. This method is suitable for the hot weather.

The second, of which the aim is to so modify the milk by dilution and additions, that the composition approximates as nearly as possible to breast milk. This method gives excellent results in temperate climates and is suitable to hill stations and the cold weather of the North, but must not be attempted in the hot weather. On the contrary we must definitely abandon all idea of feeding babies according to European standards and should regard the proportions as protein 2 per cent., fat not more than 2 per cent. and carbohydrate 6—8 per cent. as being suitable, there being a lowered tolerance to fat and increased tolerance to carbohydrate provided that part is given as dextri-maltose, e.g., Mellin's food.

The amount of food required.—The amount may be calculated in one or two ways. The first, by multiplying the weight of the child in pounds by a figure varying from 1¾ to 2½ according

to the prevailing temperature of the atmosphere. The resulting figure will give approximately the number of ounces of breast milk or its equivalent required in the twenty-four hours. A simple method of calculation for the hot weather is after the figures of Hess that a baby requires 1½ ounces of milk, one ounce of water and 1/10 ounce of sugar for every pound of body weight. It is important to note that though the food requirements go down as the temperature of the atmosphere is raised, the requirements of fluid are increased so that the baby will require three ounces of fluid or more for each pound of body weight. The following tables will serve as a guide :—

TABLE I.

According to weight (Patterson).

Weight of infant in pounds.	Ounces of cow's milk.	Ounces of water.	Teaspoons of sugar.	Number of feed.
5	7	6	5	6
6	8½	6	6	6
7	11½	6	7	6
8	13	7	8	6
9	15	8	9	6
10	17	8	10	5
11	19	9	11	5
12	21	9	12	5
13	22	9	13	5
14	23	10	14	5
15	24	10	15	5

The figures given represent the requirements for twenty-four hours. In using the above table care should be taken that the infant is not receiving too high a quantity of fat, and should the milk be obviously rich, some portion should be skimmed off.

TABLE II.

According to age.

Age.	Dilution.	Number of feed in 24 hours.	Quantity per feed.	Average quantity of diluted milk in 24 hours.	Quantity of sugar to be added to each feed.	Quantity of cream to be added.	Hours of feeding.	
			Oz.	Oz.	Teaspoon.	Teaspoon.	a.m.	p.m.
2-7 days	1—3	8	1—2	10	¼	..	..	
1 month	1—2	6	2—4	20	½	½	6. 9. 12	3. 6. 10
2 months ..	1—1½	6	3—4	27	¾	¾	do.	do.
3 „ ..	1—1	6	4—5	32	1	¾	do.	do.
4-5 „ ..	1—½	6	5—6	35	1¼	1	do.	do.
6-7 „ ..	1—¼	5	6—7	38	1½	1	6. 10	2. 6. 10
8-9 „ ..	pure	5	7—8	40	1½	1	do.	do.

High dilutions in the early weeks, with gradual progress towards whole milk as the digestive capacity increases.

HUMANISED MILK.

The principle of this method is that we follow the instructions of nature and endeavour so to modify cow's milk that it may approximate in composition as nearly as possible to human milk. In practice this method has been found to be satisfactory but its use must be limited to temperate or winter climates. At first sight the imitation of human milk is simple. By diluting the milk till the proportion of proteid is that of human milk and then adding cream and sugar, we have what is known as humanised milk. Humanising is a comfortable term, but it must not be forgotten that, as has been explained at some length in the earlier parts of this chapter, humanised milk is not identical with human milk.

Preparation :

Cow's milk 10 oz. of good average quality.

Cream 33 per cent. 1 oz. This is the average cream obtained by centrifugalisation.

Sugar 1 oz.

Water to 20 oz.

The composition of this mixture is as follows :—

Protein, 1.75 per cent., carbohydrate, 7 per cent., fat, 3.5 per cent.

Table of average requirements of humanised milk (cold weather).

Weight of infant, lbs.	Total amount 24 hours, oz.	Number of feeds 24 hours.
10	25	6
11	27½	6
12	30	6
13	32	6
14	34	6
15	36	5
16	38	5
17	40	5

Precautions.—1. It will be noted that no figures are given in the above table for very small infants. The *mixture is likely to be too rich in fat for very young babies* and recourse must be had either to a more dilute diet, or the mixture must be predigested.

2. The method is quite unsuitable for the hot weather.

3. Artificial feeding should never start with full strength humanised milk, it is difficult for the infant to digest fat in whatever form in the same quantity and proportions as in human milk. The milk should be gradually strengthened as the child shows tolerance.

Alternative method of preparing humanised milk—top-milk method.—The term top-milk is applied to the upper layers of milk which has stood for some time and into which the main cream content has risen. Top-milk, by suitable dilution, can be converted into a food of balance closely approximating that of breast milk. One pint or one quart of fresh milk is placed in a glass douche can surrounded by ice, or, if preferred, a convenient apparatus (Maw's milk humaniser), may be obtained.

The amount of cream which will rise to the upper layers will depend on the length of time of standing.

Taking a good average milk with fat percentage of 3.4 to 3.8, after four hours the composition of the top quarter will be :—Fat, 7 per cent., protein, 4 per cent., sugar, 4 per cent. The top quarter only is used, the lower three-quarters being syphoned off. This is diluted to half, with the resultant composition of protein, 2 per cent., fat, 3.5 per cent., and sugar, 2 per cent.

Sugar at the rate of 1 ounce to one pint of the mixture is finally added.

The resulting mixture may thus be compared to human milk :—

	Protein.	Fat.	Sugar.
The mixture	2 per cent.	3.5 per cent.	7 per cent.
Human milk	1.5 ,,	3.9—4 ,,	7 ,,

It is essential that the milk be stood on ice or kept in a refrigerator during separation.

The slightly lower fat content and higher protein content of the top-milk mixture are to be regarded as desirable.

POINTS COMMON TO ALL METHODS.

The addition of sugar.—For the young infant, milk sugar which may be obtained from any chemist is desirable; it is identical with the sugar of human milk and is less likely to give rise to fermentative dyspepsia. With the increasing demands of older infants the amount of sugar required to maintain the balance amounts to two ounces. Many infants will not tolerate

so large a quantity, which gives rise to intestinal fermentation, but half may with advantage be replaced by a malted cereal, such as Mellin's food.

Addition of other factors.—Lecithin powder grain 1 daily in one bottle until such time as the child is old enough to take egg-yolk (Pritchard).

Vitamin content.—As the sterilisation of milk will have an adverse effect on the vitamin content, we should guard against any possible deficiency. Cod-liver oil contains an ample supply of vitamins A and D and may be administered in the form of an emulsion daily.

To replace the anti-scorbutic vitamin, orange juice, grape or tomato juice two to four teaspoonfuls daily may be given.

Vegetable soup.—The accessory food factors are required in minute quantities only, but are nevertheless essential to perfect nutrition. In order to ensure that there is no shortage of extractives or mineral salts in absorbable form, a soup made from vegetables and bone may with advantage be added to the diet, even as early as the fifth month. Such an addition will be found of particular value at the time of the appearance of the first teeth. Details of the method of preparation will be found in Appendix I.

The following figures will be found of use :

1. Every five ounces of milk added to a pint of the mixture raises the protein content by 1 per cent., e.g.,

	Proteid.	Fat.	Carbohydrate.
Milk 10 oz., water 10 oz. Composition:	1.75	2	2.25
Milk 15 oz., water 5 oz.	2.75	3	3.4

2. Every ounce of 33 per cent. cream added to one pint of milk mixture raises the fat content by 1.5 per cent.

3. Every ounce of sugar added to the mixture raises the percentage by 5 per cent.

The second method of calculation is by the calorimetric method (*see* page 51). When modifications are required to suit individuals, the method will be found a reliable guide.

At the same time, figures based on calculations cannot be taken as rigid. Just as in the quality of food so in the quantity allowance must be made for individuality. Requirements will depend to a large extent on the uses to which the food is put. It may be burnt up to produce heat, the child will require only 2|3 or 3|4 of the cold weather allowance when it is hot. Want

of attention of this point is responsible for many cases of digestive disturbance on the voyage out to India and on transfer from the hills to the plains.

The food value may be expended as energy, a vigorous kicking baby will require more than a lethargic one. The first experiments in sitting, walking and standing will make especial demands on the energy.

The food value may be expended in growth more rapid than normal. A small rapidly growing baby will require more proportionately than a larger more slow growing one and an infant building up after a wasting disease may require as much as 25 per cent. above the average requirements for its age and weight.

The average size of the child's stomach is as follows :—
(Pritchard)

Age.	1 day.	2 weeks.	4 weeks.	8 weeks.	12 weeks.	5-6 months.	10-11 months.
Weight .. in pounds.	7	7½	8	9	10	13-14	18-21
Capacity in ounces ..	1	1.5	2	3.37	4.5	5.75	8.14

The stomach is, however, to a certain extent an adaptable organ and the actual size will depend, within limits, on the usual size of the feeds. The normal stomach will easily accommodate one-sixth of the total requirements of food in the twenty-four hours, except in very young children.

In the maze of instructions and calculations, the real test of successful feeding must not be missed. The aim is to produce a happy healthy baby with a good digestion and showing a steady rate of progress. The successful feeding consists, not only in administering food suitable in quality, quantity and cleanliness, but a careful appreciation of the results and, if necessary, a judicious modification to suit the individual requirements.

The feeding tables are laid down for the average healthy baby, but it is impossible to provide one form of diet suitable for all babies. Modifications will be necessary to suit the individual, and the diet must be made to agree with the child and not the child with the diet.

TIMING THE FEEDING.

The question of the frequency of feeding is a matter which has excited much attention of recent years and there seems little reason to doubt that, with the introduction of more modern

methods with longer intervals, there has been an improvement in the health of naturally and artificially fed infants. Above all *regularity is essential,* the child becomes trained to expect the meal at definite times and the stomach is fully emptied between each meal. The practice of feeding the child whenever he cries can only lead to ill health. *Night feeds are not necessary* unless the habit is contracted in early life, they disturb the rest of both mother and baby. The majority of babies thrive well on four-hourly feeds from the first, that is five meals a day; though there are some who require more frequent feeding in the earlier months.

The diagram on page 43 adapted from Sir F. Truby King gives an admirable summary of the daily routine.

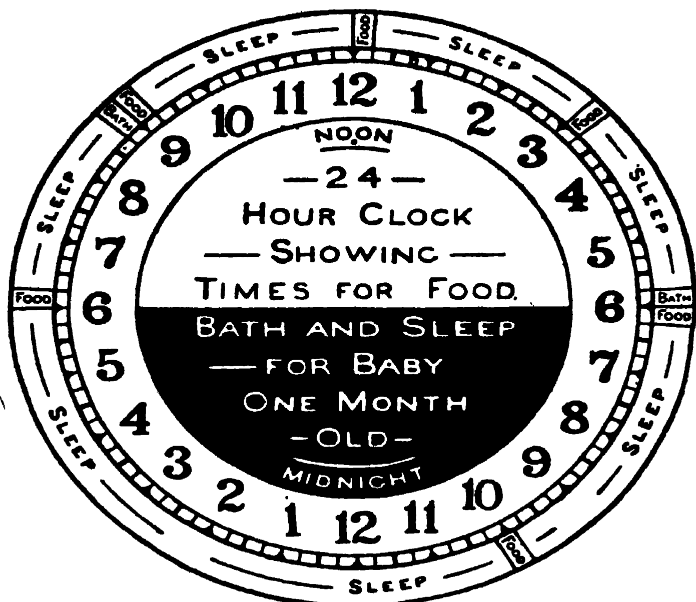
The choice of the diluent to milk.

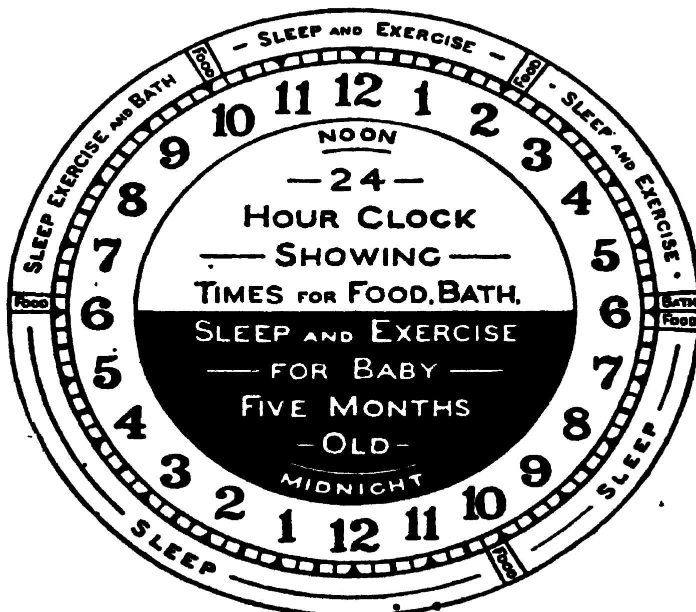
There are three substances commonly added to milk with a view to preventing the formation of a heavy curd in the stomach, which is such a serious obstacle to digestion.

Lime water.—One teaspoonful or so to each feed does undoubtedly prevent the formation of curd, but unfortunately causes constipation, and may, after prolonged use, set up intestinal irritation. The administration of lime water with a view to promoting bone formation is unnecessary and probably useless.

Sodium citrate added to milk in the proportion of two grains to each ounce of milk is of great service in tiding a delicate child over a period of indigestion, but it is not to be recommended as a permanent constituent of the diet. The action of sodium citrate is to inhibit the gastric digestion by neutralising the hydrochloric acid of the gastric juice. Digestion is either postponed till the food has passed the stomach or the intestinal juices are enabled to regurgitate and act in the artificially alkaline medium in the stomach. This will reproduce one of four effects: (1) The acid barrier, always weak in infants, will be broken down and the way laid open to invading microbes. (2) The production of acid may be overstimulated and so the habit of overproduction with acid dyspepsia established. (3) The stomach misses the educational exercise of early infancy. (4) The initial stimulus to digestion throughout the alimentary canal is lost. Further, in certain susceptible children the administration of citrate gives rise to œdema.

Barley water acts mechanically and prevents the formation of a dense clot. At the same time, the introduction of unaltered starchy food into the dietary at this period is not altogether desirable and the cereal action, to be discussed later, must not be overlooked.





Reproduced by kind permission from Sir F. Truby King's "Feeding and Care of Baby".

Taken in all, the best diluent is boiled water. If the water be first boiled, and while still hot, the milk be added and well stirred, the heavy clots will not form.

Sterilisation.

Owing to the changes and chances to which milk is subject, the occasions on which it is possible to advise the giving of raw milk are rare. Generally speaking, it is desirable to undertake some process of sterilisation. Strictly speaking sterilisation implies the destruction of all germs and the rendering of milk absolutely free from all living organisms. In practice this is not feasible, as some organisms, the spore-bearing groups, are so resistant that the amount of heat required to kill them would so materially alter the character of the milk as to render it unfit for consumption. The majority of disease-bearing organisms are, however, killed at lower temperatures. If milk therefore be raised to the temperature of boiling water, 212°F., and kept at that temperature for three minutes, it will be rendered free from the common disease-bearing germs. The milk will not have been boiled, as milk boils at a higher temperature than water, so there will be little alteration in taste. How far the process affects the vitamins is uncertain, but it is well to regard them as at a low level and replace by the daily administration of cod-liver oil and orange juice. Apart from this, there is no evidence that the nutritional value of milk, subjected to this treatment, has been impaired.

For convenience and efficiency some form of the Soxhlet steriliser is recommended. The apparatus consists essentially of a series of bottles, each to hold one feed for sterilisation, a rack to hold them and a vessel in which the bottles are heated.

The advantages are that the milk mixture for the half or whole day can be prepared at one time, separated into feeds of appropriate size and sterilised at one time. On cooling, the bottles are automatically sealed. There is thus a considerable saving of time and the risk of contamination is reduced to a minimum.

For use, the food supply for the half or whole day is calculated, divided into the number of feeds, and each feed is put into a separate bottle. The water in the boiler is brought up to boiling point and kept there for three or four minutes. The bottles are then removed and cooled as quickly as possible and then stored on ice.

When a feed is required, it is warmed to 100°F., the rubber cap removed and replaced by a nipple.

THE FEEDING OF INFANTS ON DRIED OR CONDENSED MILK.

The indications for the use of some form of preserved milk are broadly—

1. When the milk supply does not come up to the necessary high standard for infant feeding.

2. When the infant is placed on artificial feeding at a time when there is reason to expect that the necessity for further change will arise in the near future.

3. In times of epidemics.

4. Certain delicate infants, unable to digest fresh cow's milk, however modified, may be found to thrive on some form of milk powder.

In the matter of the potentialities of preserved milks the following extract from the well-known textbook "The Physiological Feeding of Infants and Children" by Dr. Eric Pritchard will be found reassuring :

"If a group of independent observers would take a series of infants and would feed them on dried milk modified to breast standard and would comply with all other physiological conditions, I am perfectly certain that they would come to the same general conclusion that I have come to after fifteen years' experience in the management of nearly 3,000 infants fed exclusively on dried milk, namely, that if this method does not give as good results as any other method, it is not the fault of the milk, but of the manner in which it is used".

DRIED MILKS.

The advantages of dried milks are :—

1. They are of known and uniform consistence.

2. They are easy to manage in the hot weather. If preferred, each meal may be prepared separately and there is no danger of it going sour.

3. The food is, as a rule, easily digested, more easily digested than fresh cow's milk, as the curd formed is much finer. Two preparations of pure milk, with a modicum of added carbohydrate, are commonly available in India. These are Sunshine Glaxo and Cow and Gate. A study of the table below reveals that the fat and carbohydrate content is approximately suitable to the Indian climate, but that the protein figure is that of cow's milk and therefore high for infant feeding in the early months. By using these foods, however, in the proportion of

two measures to three ounces of water, we obtain a more suitable protein figure in a mixture of which the contents are as follows:—

Protein, 2 per cent.; fat, 1.6 per cent.; carbohydrate, 3.9 per cent.

It is therefore desirable, having made this dilution, to add carbohydrate in the form of milk sugar or dextri-maltose (e.g., Mellin's food) in the proportion of one heaped teaspoonful to five ounces. We may then give this mixture at the rate of 2½ ounces per pound body weight in the twenty-four hours. If the baby does not thrive or is constipated, we may add cautiously some form of cream (*see* below) as the fat content is somewhat low.

In using dried milks, we must not fail to consider the vitamin content. It is now held that in dried milks, the vitamins A and B are present in sufficient quantities and that the vitamin C is absent. At the same time, making an exception of those foods to which vitamins have been specially added, it is well to safeguard against any shortage by adding a small quantity of cod-liver oil and fruit juice. In the hot weather, however, cod-liver oil is likely to give rise to indigestion and one of the concentrated preparations, such as Ostelin (vitamin D), Radiostoleum (vitamins A and D), or Adexolin (vitamins A and D), must be used.

Sometimes, in spite of the utmost care a regime such as the above does not suit the infant. In such cases, if there is evidence of protein indigestion, we may try Allenbury's No. 1 which is particularly suitable for delicate infants. Other infants flourish on acidified milk (*see* below).

It cannot be too strongly emphasised that the selection of a food should be based on a full knowledge of the contents and the requirements of the individual and that a change should not be made without reason and without plan in selecting the substitute. The trial of one food after another, with no knowledge of the contents and no appreciation of the requirements of the infant, is unfortunately a common practice.

Condensed milks are not to be recommended as a routine, the sweetened form contains a sugar content far in excess of requirements, and the unsweetened form has a high proteid and low fat content. At the same time such milks have their value in times of trouble.

Suitably diluted, they may be found valuable in the case of a wasting baby, but the sugar content is excessively high; vitamins are deficient or absent, and prolonged use will lead to the development of rickets.

Ideal milk diluted 1 to 8 is half and half cow's milk and water. As the basis of a mixture it may be useful, as the fat content appears to be more easily digested than that of dried milk.

The composition of the more commonly used prepared milk foods with *low fat and carbohydrate, but high protein content* are given below :—

SUNSHINE GLAXO, diluted 1 to 8 (export)—

Fat, 2.5; protein, 3.1; carbohydrate, 5.8.
Iron, 5 pts. per 1,000,000.
Vitamin D, 130 I.U. per pint.
Caloric value, 135 per ounce of powder.

The average child in the hot weather will therefore require just over two measures of the powder for each pound of the body weight in twenty-four hours. Vitamins need not be added, but fruit juice should be taken.

COW AND GATE, diluted 1 to 8 (export)—

Fat, 2.3; protein, 3.37; carbohydrate, 5.7.
Caloric value, 135 per ounce of powder.
Vitamin D, 250–300 I.U. per pint.

Average requirements for child as for Sunshine Glaxo. Fruit juice to be added to the diet.

Foods containing *low protein and high carbohydrate.* Suitable for delicate children and those suffering from protein indigestion as a temporary feed :—

ALLENBURY'S—

Number.	Albumin	Casein	Fat	Lactose	Dextri-maltose	Caloric value.
1	0.7	1.0	3.1	7.3	3.25	134
	1.7			10.55		
2	0.7	1.15	2.9	6.7	3.8	134
	1.9			10.5		

Irradiated Ergosterol has been added.

HORLICK'S MALTED MILK POWDER—

Protein, 13.8; fat, 9; carbohydrate, 70.8.

MELLIN'S FOOD—Pure dextri-maltose.

A good cream supply is more difficult to obtain than a good milk supply, the fat value of the cream is inconstant and often unknown. Yet there are times when it is desirable to increase the fat content of the food, especially if we are using diluted milk.

A great deal of research has been devoted to the preparation of an artificial cream which will present not only all the essential characters of natural cream, but some advance in the matter of digestibility. Such creams are prepared from animal and vegetable oils reduced to a fine degree of emulsification, so that the fat is presented in the form of minute droplets easily attacked by the digestive juices. Some of these creams are designed not only to supplement the fat contents but also to ensure against any deficiency in the milk or milk powder to which they are added. For this purpose, fresh butter from cow's milk or cod-liver oil form a proportion of the ingredient, as both are rich in fat-solubles A and D. Such creams must not be expected to replace any deficiency of vitamin C, for which fresh fruit juice must be given. The advantages of such creams are manifest, and they may be used in conjunction either with fresh or dried milks.

One of the great difficulties of artificial feeding of infants is to keep the fat content at an adequately high level, as the infant is apt to be intolerant of fat from other sources in the same proportion as in breast milk. An artificial cream with the type of fats well balanced and the fat globules finely divided, has been found in practice to be more easily digested than fresh cream. Further, it is of known and uniform strength, sterile and always available. Examples of such creams are New Zealand cream prepared after the formula of Sir Truby King and Brestol. They must be used with caution in this country, but are valuable additions to the diet in the cold weather and, further, are well taken by children as a substitute for butter.

A further method of increasing to a small degree the fat content and making up any deficiency in vitamins, is to add to the bottle a cod-liver oil emulsion, as under :—

℞

Cod-liver oil	♏ 30
Mucilage acaciæ	♏ 5
Ol. Amygdali dulc	♏ 1|16
Ol. Cinnamoni	♏ 1|40
Elixir Glusidi	♏ 5
Chloroform	♏ 1|16
Benzoic acid	gr. 1|16
Decoction of Irish Moss to 1 drachm.	

(Great Ormond St. prescription).

One teaspoonful two or three times a day in the feed.

ADDITIONAL FACTORS.

Fruit juice at least two teaspoonfuls daily should be added. Lecithin and broth, as for cow's milk feeding.

SPECIAL METHODS OF FEEDING.

Predigestion of milk or milk mixtures.

Predigestion will be found of great value not only to delicate infants but also in the feeding of older children during the acute stage of illness. In order that the full benefit may be obtained, the ferments must be given ample time to act, the common method of allowing ten minutes or a quarter of an hour is of very slight value.

After a period of feeding on predigested food, it is desirable to allow the digestion of the patient to assume its functions gradually, for this purpose the time of predigestion should be shortened by stages.

Method.

Take one pint of milk or milk mixture prepared to the correct formula, bring quickly to the boil and cool down to about 117°F. Add two teaspoonfuls of liquor pancreaticus (Benger) or other suitable digestive powder. The temperature of the mixture is maintained at about 117°F. by placing the vessel in a container of water at 120°F. Stir occasionally.

The digestion is allowed to proceed for from one to three hours, at the end of which time the mixture is brought rapidly to the boil and cooled in the ice-chest.

Modification to suit the individual may be made by skimming the milk before digesting and adding lactic acid, 2 drops to each ounce, before administration. Sugar or dextri-maltose may be added to suit the case. The method may be applied to dried milks made up to requisite strength before peptonisation.

FRESH BUTTER MILK OR SKIMMED MILK.

This is a form of food to which frequent recourse will be had during the hot weather, when the full fat content of milk may cause digestive disturbance; it is also of value in fevers, when full-cream milk is distasteful and unsuitable and it is used for those infants who show evidence of weak fat digestion. It may be prepared on the same principle as top-milk, using the lower three-quarters instead of the top quarter. The percentage composition is approximately :—

Protein, 3 per cent.; sugar, 4.8 per cent.; fat, 0.5 per cent.; caloric value, 10 per ounce.

BUTTER MILK (GLAXO).

A new preparation known as butter milk powder G. L. formula has proved of value in a number of cases showing high intolerance to fat. It may be used diluted one in ten when the formula is as follows, or somewhat stronger.

Reconstituted.

	Per cent
Fat	0·55
Protein	3·35
Lactose	4·2
Ash	0·75
Lactic acid	0·65
Citrates, etc.	0·15
Moisture.	

Caloric value, 10.2 per ounce.

ARTIFICIALLY ACIDIFIED MILK.

The physiological reasons on which this form of feeding is based are that the normal hydrochloric acid content of the gastric juice of infants is low; is easily abolished in illness or conditions of exhaustion and that the mineral salt content of cow's milk is proportionately so high that the available acid is fixed and none is left for digestive purposes.

The consequence is that not only is the gastric digestion incomplete or inert, but that the stimulus to digestion lower in the alimentary tract is wanting.

The writer has found this method invaluable in that state of exhaustion following a prolonged digestive disturbance, when it is difficult to stimulate the digestion to any signs of activity and also for those babies who may be termed difficult feeders who are slow to develop to normal digestive capacity and refuse to thrive on any modification of cow's milk.

The acid added may be either organic or inorganic, lactic acid or hydrochloric.

Preparation.—The preparation of lactic acid milk is as follows :—

One pint of milk is boiled, cooled and the skim removed. To this is added 45 minims of lactic acid (British Pharmacopœia) drop by drop, stirring four times between each drop.

The milk must not be heated after the addition of the acid or it will curdle.

This method may be used also with milk prepared from a dry milk powder.

Dilute hydrochloric acid 2 to 4 minims to each feed may be used with advantage in conjunction with predigested milk.

Lacidac (Cow & Gate Co.) is a dried milk with the necessary quantity of acid already added. It is used in the same way as the *ordinary* dried milks and is easy to prepare.

Calorimetric methods of estimating the food requirements of infants.

The individual needs a certain quantity of food. (1) To maintain the nutrition and heat of the body. (2) To provide energy for the muscular movements of the body including the beats of the heart and respiration. (3) The building up of tissue in growth and repair.

The expenditure of foodstuffs in the human body is comparable to the consumption of fuel in an engine and each article of food has a combustion value which can be measured and is commensurate with its value to supply the necessary fuel for the processes connected with life.

A *calorie* is a unit of heat and is the amount required to heat one litre of water through one degree. A ton of coal by burning produces a definite number of calories and, in the same way, an ounce of milk or other food has a definite caloric value in the human body and may be expended either in the production of heat or its equivalent in energy or growth.

The caloric values of various foodstuffs have been estimated experimentally and the results of such experiments give a numerical indication of their food value. At the same time, by observation, the number of calories required at different ages and weights is known, so that by combining this knowledge with our knowledge of the caloric values of foods appropriate to the age, we are able to express the requirements of the infant in terms of some particular article of food.

The caloric value of human milk is 18 per ounce and from the amounts of milk taken by average healthy babies that we are able to fix the caloric requirements of infants. Thus a child of 10 pounds weight requires 35 to 50 calories to each pound of body weight and a child of 20 pounds 30 to 45 according to the climate.

This method of calculation is of great value in the feeding of those infants whose digestion demands a divergence from routine lines. For instance, a child shows signs of intolerance of fat, and the fat of the diet must be reduced. By the calorimetric method, it is easy to estimate the amount of reduction and replace the deficit by other food of equivalent caloric value. It is not wise to apply the method too closely in the case of delicate infants, but, at the same time, a careful count of the caloric value should be taken daily, so that should the child, of necessity, be underfed, the fact does not escape notice and early efforts may be made to bring the diet up to the required standard.

Example.—It is decided to feed a child which is convalescent from a digestive disturbance on milk and water half and half.

The child is 10 pounds in weight and should normally take 25 ounces in the course of the day.

Twenty-five ounces of the above mixture at 10 calories per ounce is 250 calories.

A child of 10 pounds weight requires 350 calories. The child is, therefore, though receiving the correct bulk of fluid, underfed. The fact is appreciated and as the digestion settles, efforts are made to make up the deficit. Each ounce of milk added to the mixture raises the value by 18 calories, the addition of one teaspoonful of sugar or malted starch by about 14.5 and one teaspoonful of medium cream by about 10.

Cautions and exceptions.—The chart should be used not only with reference to the weight, but also to the age of the baby. Infants below the average weight will require more proportionately even up to 70 to 75 calories per lb. Conversely, fat children above the average weight will require less per pound.

Calorific calculation is not admissible till the child is established on a diet. At the commencement of weaning or in the first few weeks of life, the child must be underfed in terms of calories. Similarly, when it is found, for any reason, necessary to change the type of feeding, the full caloric requirements must be approached gradually.

After the ninth month, there is a period of gradual advance from the purely infant diet to that of childhood. This is not a matter merely of additions, but also of replacements. It will be necessary to make reductions in certain items of the diet, notably milk, butter may take the place of cream and bread of baked wheat or sugar. It is necessary to know the food value of each article added and the proportional value of those to be replaced. The only way in which change can be satisfactorily carried out is by reducing the food values of all foods to a common denominator, in other words, by expressing them in terms of calories.

Table of caloric values of common articles of diet in infancy and childhood (common food materials used in India).

R. McCarrison.

Cow's milk	..	Calories	18	per	ounce
Human milk	..	,,	18	,,	,,
Buffalo's milk	..	,,	30	,,	,,
Whey ..	..	,,	8	,,	,,
Cream ..	..	,,	55	,,	,,
Cheese ..	..	,,	111	,,	,,

Butter milk	..	Calories	10	per	ounce
Skimmed milk	..	„	10	„	„
Butter ..	..	„	208	„	„
Lean beef	..	„	43	„	„
Liver ..	..	„	43	„	„
White sugar	..	„	113	„	„
Brown sugar	..	„	108	„	„
Goor or Jaggery	..	„	100	„	„
Honey ..	..	„	81	„	„
Tapioca ..	..	„	100	„	„
Sago ..	..	„	97	„	„
White flour	..	„	102	„	„
Barley ..	..	„	100	„	„
Oatmeal ..	..	„	115	„	„
White bread	..	„	70	„	„
Brown „	..	„	60	„	„
Suji or Semolina	..	„	80	„	„
Biscuits ..	..	„	120	„	„
Egg, white	..	„	14	„	„
„ yolk	..	„	108	„	„
Soup ..	..	„	3	„	„
Jam, average	..	„	81	„	„

Special articles.

Sunshine Glaxo	..	Calories	135	per	ounce.
Cow & Gate (Export)		„	135	„	„
Allenbury No. 1	..	„	134	„	„
„ No. 2	..	„	134	„	„
Benger's food	..	„	107	„	„
Mellin's food	..	„	105	„	„
Prepared barley	..	„	103	„	„

CHAPTER VI.

WEANING AND DIET IN CHILDHOOD.

General principles.

Every article legitimately considered as food may be said to consist of two parts, one which can be so altered by the digestive juices of the body as to become available for absorption into the body, and the other, known as the roughage, more or less untouched by digestion, but having its uses in stimulating the bowel and serving as a medium to carry away substances formed during the elaborate chemical processes of the body, which, if retained, would act as poisons. In the infant, some proportion of the fat in the food serves this purpose. The digestible portion of the food consists firstly of three main groups of chemical bodies, each group having different chemical formation and different function, though the functions are to a certain extent interchangeable. Each common article of diet contains one or more of these fundamental groups in varying proportions thus :

	otein.	Carbo-hydrate.	Fat.
Cow's milk	3.5	4.5	4
White bread	7.2	41.8	0.2
Egg white	10.7	0.0	0.1
„ yolk	15.5	0.0	33.3

Each constituent is essential in due proportion and its deficiency cannot be made up by excess of others, so that the rate of growth and progress is limited by deficiency in one constituent however plentiful the others may be. It is therefore important that the sum of the primary elements is in due proportion and amount to the needs of the body at any particular age and varied to some degree in accordance with occupation.

PROTEINS.

Proteins available as food supply are widely distributed throughout edible materials. During the process of digestion proteins are split up into less complex bodies, the amino-acids which are subsequently reconstructed in the tissues to form living proteids and to carry out the main functions of growth and repair of tissues and elaboration of secretions. The food proteins are not all of the same structure; the amino-acids derived from them

differ and are not all equally valuable in the reconstruction of a particular form of protein suitable to the individual. We therefore describe those proteins which afford the highest quality of suitable amino-acids as proteins of the first class. These proteins are mainly found in animal food and the source of supply in early life is from milk. The value of milk as an additional food factor during later childhood has been proved. Proteins may also be converted into energy but this is an extravagant and undesirable process as poisonous waste products are formed which will throw an extra strain on liver and kidneys. It is desirable that a protein balance be established (*see* below) the body taking in the full amount of protein required but no great excess. In the child the amount is two grams per kilo body weight or approximately 30 grains to one pound, diminishing as age advances and the rate of growth abates.

Suitable proteins.

Milk, curds, cheese, eggs, kidney, liver, meat, sweetbreads, fish, green leafy vegetables such as spinach, lettuce and young soft carrots. Whole wheat flour to some extent (McCarrison).

FATS.

The deposit of fat in the body serves to keep the organs in place, to protect the more delicate structures from injury and as a heat regulator. Fats used in the body chemistry are a source of heat and energy and are necessary for the provision of certain more obscure chemical bodies essential to function. They are also an important item of the food as a source of vitamins. Fat storage in the body is most easily and directly obtained from fat in the food though it may be formed from other food constituents, particularly carbohydrate.

CARBOHYDRATES.

This group includes sugars and starches of all kinds. As source of heat and energy, they are easily burnt up to simple innocuous bodies throwing no strain on the excretory organs. In order to render the combustion of fats complete, the presence of carbohydrates in a proportion of at least 1.5 carbohydrates to 1 of fats is necessary.

The amount of carbohydrates in the food is usually adequate but if there is an excess of fat in the food the carbohydrates may prove insufficient for the complete combustion and the child is liable to develop acidosis (*see* Chapter XIII). Further, children of a particular type, the nervous, highly strung and energetic type, are liable to utilise available carbohydrates quickly and the supply

therefore must be large and given at frequent intervals lest symptoms of exhaustion supervene. The blood sugar of a child is subject to a considerable variation and the amount is rapidly reduced when the period of abstinence from food is prolonged. It is therefore advisable that the child should not go for more than four hours without food and that after any period of forced abstinence the first food taken should be of carbohydrates.

A well-balanced diet is an acceptable palatable diet, which, on analysis, is found to contain the different essential constituents in just such proportions as they are required by the individual.

A consideration of these functions will lead to the just deduction that, having regard to the varying activities of the human race, one standard of diet will not do for all, the infant is engaged in growing, at an enormous proportionate rate, while the adult, having ceased to grow, requires nutriment for repair and the production of energy, and so the balance cannot be the same.

It has been estimated that for the infant the correct balance of proteid to non-proteid is 1 to 7, altering slowly with advancing age till for the adult it is 1 to 6 or 5·5.

The fat proportion differs even more markedly.

	Fat.	Carbohydrate.
Infant	1	2
2nd year	1	3·3
Adult	1	10

These proportions are frequently neglected, particularly in regard to the diet of young children, whose diet includes such a large proportion of cow's milk that the protein—non-protein ratio is often 1 to 3.

MINERAL SALTS.

In addition to the prime principles, there are other constituents minute in quantities, but no less essential to health and growth. Mineral salts are required, not only for bone building, but play an essential part in all the complicated chemical processes of the body in life. A deficiency of one or other may cause striking effects, a want of iron will cause anæmia, a deficiency of calcium may lead to convulsions, and a deficiency of iodine may bring in its train a series of severe symptoms.

In India particularly in Bengal or other countries on an alluvial soil there is a considerable difficulty in maintaining an adequate mineral supply owing to the poor mineral content of the vegetables which are the main source of supply. The vegetable broth (*see* Appendix I) is a convenient vehiculum for maintaining

the supply for young children. There is ample evidence that mineral deficiency, especially calcium and iron deficiency, is extremely common and it is therefore necessary to supplement periodically by the administration of these minerals in the form of tonics. The deficiency may be made up but the retention and utilisation of the minerals can only take place where there is also an adequate supply of vitamins. The prevalence of nutritional anæmia in Bengal is due to the want of these accessory food factors.

List of foods affording good supply of mineral salts :—

Calcium (lime)—milk, butter milk, cheese, whey, yolk of egg, dals, fruits of all kinds and green leaf vegetables.

Phosphorus—milk, butter milk, eggs, dals, wheat, oats, barley, spinach, carrot, cauliflower, brussel sprouts, meat and fish.

Iron—liver, red meat, eggs, dals, whole cereal grains, spinach, leeks, lettuce, onions, tomatoes (R. McCarrison).

VITAMINS.

These bodies are known by the effect of their presence or absence. They may be considered as the spark that ignites the food fuel. Of late years, a substance considered identical with vitamin A has been produced by the action of ultra-violet rays on cod-liver oil, but beyond this we know them by their habitat, their virtues and the means by which they may be destroyed. One fact we are sure of, that these vitamins, intangible though they may be, are essential to health and we associate a definite train of symptoms with the absence or deficiency of one or other of the groups into which they are divided.

Medical men are familiar with a disease which develops in the absence or gross deficiency of one or the other of the vitamins, such diseases as rickets or scurvy, but, as Sir Robert McCarrison has pointed out, the deviations from health as a result of minor deficiencies are not fully appreciated and it is in infant and child feeding as a whole that we must guard against the minor deficiencies.

At present five main divisions are made, but of recent years there have been further subdivisions according to the properties ascribed to the results observed by the absence or deficiency of the vitamins of these subdivisions. It is not necessary at this juncture to enter into a minute classification. It will be more appropriate to consider the properties and results of deficiency of vitamins under the main groups. (A list of foods with their vitamin value will be found in Appendix III.)

Properties of vitamins.

Fat-soluble vitamin A. Growth promoting, provides resistance to infection, deficiency produces xerophthalmia. Chief sources :—fresh milk, butter, cream, cod-liver and halibut liver oil.

Water-soluble vitamin B. Growth promoting. Complete absence will produce beriberi. If the supply is insufficient the results will be loss of appetite, indigestion and general irregularity in the function of the alimentary canal. There will be loss of weight, and general weakness with lack of vigour and a tendency to anæmia. Chief sources :—whole meal, whole grain, vegetables.

Water-soluble vitamin C. Anti-scorbutic (*see* scurvy). Chief sources :—fresh vegetables and fruits.

Fat-soluble vitamin D. Controls the phosphorus and calcium content of the body. Prevents rickets and diseases associated with calcium deficiency (*see* Chapter XX). Chief sources :—as for vitamin A.

Vitamin E. The reproductive (of importance in later life).

Although these distinctions are made, there is ample evidence that the vitamins are to a certain extent interactive and that the general well-being of the child depends on an adequate supply of all varieties. These bodies, so essential to health, are unfortunately delicate. By prolonged cooking, during the process of preservation of food and in tinned foods much of the vitamin value is lost.

It has been emphasised in the earlier chapters that the vitamin content of the mother's diet must be adequate, if the baby is to be born healthy and if she is to feed it satisfactorily.

WATER.

The human being can live for many days on water only, a fact which has not only been proved by the historic feats of professional fasters, but is a matter for daily observation when dealing with the sick. The converse does not hold good, and particularly in infancy, does the deprivation of water or excessive loss of fluid produce early menace to life. There is a constant exchange of water in the system, it is a component of all living tissues, it supplies the necessary fluidity of the blood and it dissolves and carries away waste products from the body.

The child, in proportion to its size, requires more water than the adult. The requirements of the average infant are calculated at 2½ ounces or more for each pound of weight. It is a cruel and hurtful thing to deny the free use of water to children. The error of taking too much is not likely to be

committed. Some children, indeed, do acquire the habit of drinking water more frequently than is necessary and require guidance. A child should be discouraged from taking large draughts at the beginning of a meal though a draught taken an hour or half an hour before does no harm.

It is to be remembered that in hot dry climates, both through respiration and perspiration, the amount of fluid lost from the body is vastly increased and that this loss must be replaced.

In illness, particularly in diarrhœa, when the loss of water from the body reduces the available fluid to dangerously low levels, the first aim and the essential treatment is to replace this fluid by some means or other before the serious symptoms of water deprivation show themselves.

DIET AFTER THE APPEARANCE OF THE FIRST TEETH.

Although it is customary to regard the age of nine months as that at which the diet of the infant should be changed, or rather, other forms of nourishment included in the dietary, it may be laid down as an axiom that the change should be made, not rigidly according to age, but according to the maturity of the system as indicated by the appearance of the teeth. In the case of a backward or delicate child we should naturally incline to delay and allow the child to have the benefit of the easily digested breast milk for some weeks longer. On the other hand, exceptionally vigorous and advanced infants may demand more concentrated food at an earlier age than is usual. Till the appearance of the first teeth, however, no change is made. Before this, the digestive functions have not matured sufficiently to deal with diet other than breast milk or its artificial equivalent. At the same time, though the appearance of the first teeth is the signal for advance, no change should be made during the actual eruption, a time when the digestive system is particularly sensitive to strain.

The secret of success in the transition to mixed diet lies in the gradual education of the digestive system and the consolidation of each step before a further advance is made. The commonest errors made are :—

(1) The first additions are made too suddenly. The bottle feeds are thickened to a degree incompatible with digestion.

(2) No provision is made for the development of the jaws by the supply of solid food, baked crusts or rusks. This should be the first addition as soon as there is any sign of the onset of dentition.

(3) The maintenance in the later stages of too large a quantity of milk in the diet, so that the child has no appetite for other forms of food and the balance (*see* Chapter V) is incorrect.

(4) The addition of more than one new article at a time, so that, in the event of disagreement, it is difficult to know the precise article on which blame should be laid.

(5) Insufficient attention to the vitamin content.

WEANING.

The first step is the change from the breast to the bottle. Amongst European mothers, it is usual to accustom the baby to artificial feeding before proceeding to mixed feeding. This is not essential, but, in the interests of the mother, she may be considered to have done all that she safely can, if she has fed the baby till the arrival of the first teeth. Considerable practical difficulties in nursing arise when the teeth are in the process of eruption and the baby is biting hard at anything which is placed within the mouth.

The process of weaning should be gradual, one meal at a time being changed, the whole process being accomplished in from three to five weeks. For this reason, weaning may be commenced towards the end of the eighth month, so that the baby is ready to make further advances as the system demands. There is still the same necessity for maintaining the physiological balance, so the substitute may, with advantage, take the form of humanised milk, though at first the fat content should be kept at a definitely lower standard than that of breast milk. The balance is at this time gradually altering, with an increased demand for carbohydrate (farinaceous) food. At two years the proportion of carbohydrate to fat is 3.3 to 1 instead of 2 to 1 as in infancy. The proportion of proteid in the diet is also very slightly raised.

During the process of weaning the child will, if fed on humanised milk, have become accustomed to some form of malted starch, so that the next step may be in the form of an unchanged carbohydrate; rusks, groats, baked flour or oatmeal jelly, such food being added in a tentative manner and the result observed. Of all these articles, the first to be added will be the rusk or baked crust, which will teach the child to chew, develop the jaws and assist in the cutting of the teeth. If, on the contrary, the baby has been accustomed to whole milk feeding, or some approximate dilution, the first step will be to add some intermediate food, such as Mellin's, to the diet and then proceed to the introduction of the unaltered farinaceous food.

MIXED DIET.

Though considerable advances will be made within the next three months, milk will be the basis of the diet, and if the child has been fed on humanised milk mixture, the milk content in this will be gradually increased, while the added cream will be correspondingly diminished, till at the end of the year the child is taking pure cow's milk.

At the same time, with the addition of the farinaceous food to the bottle, the sugar will gradually be reduced.

The number of meals in the day is reduced by the gradual cutting down of the ten o'clock feed, till ultimately the meals are four in the day with the addition of an early morning drink of fruit juice, sugar and water. This must, of course, be subject to circumstance; when the children take their airing in the early morning, something more substantial must be given. As to timing, in India, the time-table for the child is fixed according to atmospheric conditions and the most suitable hours for outdoor air and exercise.

The tenth month of life, therefore, is spent in weaning, the only addition being at first rusks, one given a quarter of an hour before two or three meals. Later, a small amount of baked flour, groats or oatmeal jelly may be added.

If vegetable broth has not been given at an earlier age, it should now be introduced, from four to five ounces being used as a substitute for water in one of the bottles.

The amount of milk or milk mixture at this age will be from thirty-eight to forty ounces in the day.

Age : 10 months, 11th month of life.

Additions : Groats or baked flour; milk pudding, made from rice or sago, starting with two teaspoonfuls; egg yolk on alternate days, starting with one teaspoonful; gravy and beef tea.

The total amount of milk, 30 to 35 oz.

Water will be necessary between meals.

Age : 11 months, 12th month of life.

Additions : Gravy and potato; egg or steamed custard; bread and butter.

Total amount of milk, 25 to 30 oz.

The diet from the 13th to the 18th month :—

Early morning : Orange juice, sugar and water.

Breakfast : Toast and butter, one slice; barley jelly or strained oatmeal; milk, 8 oz.

Lunch : Gravy and potatoes or boiled egg and breadcrumbs; milk pudding; bread, one small slice, or rusk or toast; vegetable soup; milk, 4 oz. in pudding, or stewed fruit.

Tea : Milk, 8 oz., rusk; bread and butter; sponge cake.

Cocoatina may be added to the milk.

The milk may now be given pure or, in the hot weather, with one-quarter of its bulk in water added.

After the fifteenth month, steamed fish or brains or pounded chicken beginning with one tablespoonful may be added.

Diet 18 months to 2 years :—

Early morning : Fruit juice with sugar and water.

Breakfast : Groats or strained oatmeal with milk, treacle or sugar; milk, 8 oz.

Lunch : Fish or pounded chicken or brains, or chicken pish-pash; once or twice a week, liver and spinach soup; stewed green vegetables, young carrots or vegetable soup; milk pudding or stewed fruit or junket; water to drink.

Tea : Rusks, biscuits, sponge cake; honey or fruit jelly; milk, 8 oz.

Supper : Cup of milk with biscuit of Horlick's malted milk.

Note.—Total milk, including that used in cooking, 1 to 1¼ pints. A boiled cutlet or other suitable bone should be given daily for a few minutes for the child to gnaw.

Diet 2 to 5 years :—

Early morning : Orange juice or grapefruit juice or tomato juice with sugar to taste.

Breakfast : Porridge or groats with milk, sugar or treacle; eggs three days a week; bread and butter or crisp toast with honey or fruit jelly; milk, 8 oz.

Lunch : Fish or meat (mutton, beef or chicken); potato, baked, mashed or boiled; mashed vegetables (cauliflower, carrots or greens); milk pudding with stewed fruits, junket or custard; water to drink.

Tea : Toast and butter; sponge cake; honey or fruit jelly or stewed fruit and custard or junket; milk 6 to 8 oz.

Supper : Cup of milk or Horlick's malted milk.

Note.—Total amount of milk 16 to 20 oz.

The following vegetables are suitable for young children: Peas, vegetable marrow, boiled cucumber, Jerusalem artichokes, cauliflower, young cabbage or carrots well mashed, onions. Before 18 months, they are best given in the form of strained vegetable broth.

GENERAL INSTRUCTIONS.

The advance to mixed feeding is one of education, each step must be taken cautiously with due observation of the results. It must be borne in mind that if the child is upset by the too

rapid addition of new forms of food, his progress may be delayed for months.

Above all, the child must be instructed in that most important preliminary to digestion, the proper mastication of food. Without this, the teeth cannot be properly cut, the jaw will not develop, and the shape of the face remain immature. Further, there will not be due expansion of the nasal airway, so that any tendency to adenoids may be perpetuated.

Rest after a meal, for a short time, is always desirable, as all the nervous force is required for digestion.

Salt should be added in moderation to all meals, but children should not be allowed to partake immoderately, as many will if permitted.

Eating between meals must never be permitted though water may be allowed and should always be available.

Sugar is perfectly harmless in moderation, but in excess it causes acidity and fermentation, and perverts the appetite. A moderate amount of ripe fruit may always be given with safety to a child over two years of age, but nuts, bananas, dried or preserved fruits (except when stewed) should never be allowed. Tea should not be allowed before the age of five, though the merest drop in the milk can do no harm and will please the child. Alcoholic liquors in any form, except when prescribed as a medicine, should never pass the child's lips.

Among other articles to be avoided may be mentioned: Jams with pips or seeds, coarse oatmeal and fruit having hard fibres, such as pine-apple.

Most children dislike fat and it should not be forced on them as the necessary content in the food is already provided.

Chocolates and sweets in moderation may be allowed immediately after meals, but they should not be given between meals.

CHAPTER VII.

TEETHING AND GENERAL PROGRESS.

The period of teething is apt to be regarded as one of restless nights and a time of anxiety. Let it be said that in the case of the normal healthy and properly fed baby, *teething is a period possibly of fretfulness but not one of illness or danger. At the same time the child is more susceptible to digestion or nervous disturbances* and *any deviation from normal health or any inherent weakness is likely to be accentuated.*

The order of appearance of first set.—There are two periods of teething, the first in infancy, the second in childhood. The germs of the first (milk or temporary) set have existed within the jaw for several months before birth, but they are at no time covered with true bone. As ossification advances, the tooth rises, and pressing upwards, causes absorption of its capsule and the gum, till by their removal the tooth makes its appearance. This upward progress, in its later stages, is what we mean when we talk of "teething". The temporary teeth usually appear in the following order :—

1. The two middle incisors of the lower jaw, at about the seventh or eighth month (Fig. 1).
2. The corresponding teeth of the upper jaw, at about seven and a half or eight months (Fig. 2).
3. The two upper lateral incisors, at about the ninth month (Fig. 3).
4. The corresponding teeth of the lower jaw, at the tenth month (Fig. 4).
5. The two front grinders or molars of the lower jaw, from 12 to 13 months (Fig. 5).
6. The corresponding teeth of the upper jaw, at about 14 months (Fig. 6).
7. The four eye-teeth or canine teeth in the vacant spaces, between the sixteenth and twentieth months (Fig. 7).
8. The second grinders, between the twentieth and thirtieth months (Fig. 8).

The appearance of second set.—With the appearance of these 20 teeth, the first dentition is completed. Strange as it may appear, the germs of the second set also existed in the jaw before birth, more deeply seated than those of the milk teeth. At about the sixth or seventh year, a grinder appears behind each of those already existing, making a total of 24 teeth, and soon after their

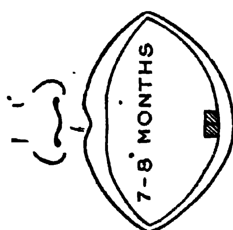


Fig. 1.

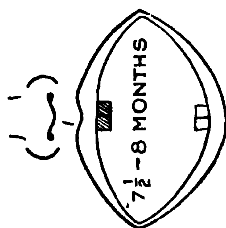


Fig. 2.

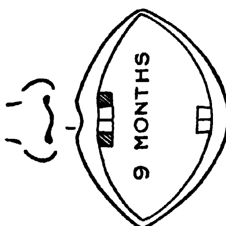


Fig. 3.

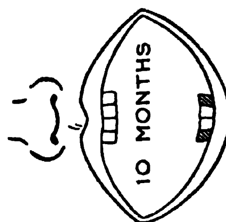


Fig. 4.

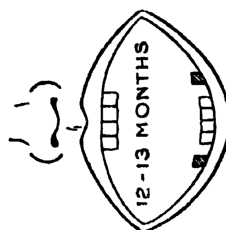


Fig. 5.

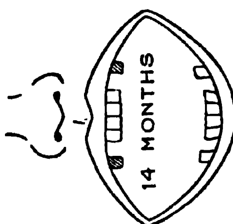


Fig. 6.

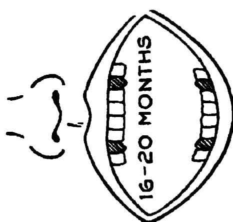


Fig. 7.

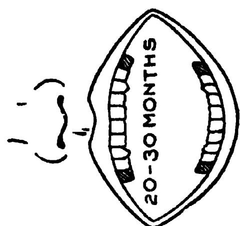


Fig. 8.

The order of appearance of first (milk or temporary) set of teeth.
The most recently erupted teeth are shown shaded.

appearance the central front teeth fall out, their roots having been absorbed by the advance of the young permanent set. About a year is occupied in shedding the four central cutting teeth and another year by the four outer cutting teeth. During a third year the front grinders are similarly replaced. Next, the second temporary grinders, and lastly, the eye-teeth are shed at any time from 9½ to 12½ years, while a little later, four new grinders show themselves, making 28 teeth. Between 17 and 21 years, the last four grinders, or the "wisdom teeth", complete the full set of 32.

The order above related is not invariably followed. On the contrary, deviations are numerous. Children have, rarely it is true, been born with teeth, and children have reached the age of 1½ years without a tooth showing, but the above description is the general rule. Very frequently the side cutters of the upper appear before those of the lower jaw, and often the temporary eye-teeth fall out before any of the grinders.

As a rule, the teeth appear with a close approach to regularity. Delay usually implies want of development, consequent upon some constitutional fault, e.g., rickets, or as the result of diet deficiency particularly as regards mineral salts and vitamins.

The symptoms attributed generally by mothers and often by doctors to painful dentition are legion. There may be alarmingly high fever, with vomiting and loose green or offensive motions, or there may be pharyngeal, tracheal or bronchial catarrh. There may be eye, ear and nervous affections. There may be every kind of pulmonary disease. In short, there is no disease for which dentition has not been held responsible. But one asks, would it not be strange if teething did not often coexist with every illness of infants between six months and two years of age? *In the vast majority of cases, teething is a mere coincidence.* Indeed, one can hardly recall a case where gastro-intestinal disturbance did not precede the painful state of the gums, and the probabilities are that due to improper food or faulty milk, the whole intestinal tract becomes congested and inflamed.

The main facts may be summed up as follows. A healthy child cuts the teeth naturally and without disorder save some irritability and restlessness. During the process of teething any tendency to constitutional weakness is exaggerated and will show itself. Thus the child with an unstable nervous system will be more prone to sleeplessness, irritability and even convulsions. The child with a habitually weak digestion will tend to develop diarrhœa, the child who is the subject of bronchitis will develop that disease.

At the same time, it is incorrect to attribute these results directly to teething, the fundamental fault must be sought and if possible eradicated. In the majority of cases the error is one of calcium and vitamin deficiency (*cf.* Chapter XX). Such diverse conditions as nervous instability and bronchitis may also be attributed to this cause.

It cannot be too strongly emphasised that such disorders as diarrhœa and skin rashes, or the recurrence of bronchitis with the appearance of each tooth, must not be regarded as the natural phenomena of teething; they are on the contrary an indication for a careful scrutiny of the diet and general health.

GENERAL MANAGEMENT OF TEETHING.

Signs.

The general signs of the approaching eruption of teeth are dribbling of the mouth, desire to put things in the mouth and chew all available objects with a certain irritability, restlessness at night and possibly some irregularity of appetite. Having come to the conclusion that an eruption of teeth is impending, we should be particularly careful as to the correctness of the diet and guard against exposure to chill. Constipation should be avoided, diarrhœa should be treated and sometimes when there is much restlessness or irritability at night, small doses of bromide may be given with great advantage. For the rest, the food should be cut down by one-fourth and the bulk replaced by water. A powder as follows may be given :

Pulv. hydrarg. c. cret. gr. ¼, pulv. rhei co. gr. 1, twice daily.

Gentle rubbing of the gums with glycerine will alleviate the discomfort. The child should be supplied with hard rusks or baked crusts to chew immediately before two meals and a boiled bone ring or cutlet bone to chew. Lancing the gums is seldom if ever necessary. The appearance of the first teeth is a sign that the time has arrived for the alteration of the diet or the commencement of weaning, but no radical changes must be carried out during the time of eruption as the digestion at this moment is intolerant of changes.

Delay in the cutting of the teeth should lead to :—

A. Careful scrutiny of the child's health and general progress.

B. Scrutiny of the diet.

C. Careful scrutiny for rickets.

The addition to the diet of cod-liver oil 30 drops twice a day in the cold weather or Radiostoleum five drops a day or Adexolin two drops in each bottle in the hot weather, together

with vegetable broth, will do much to promote active development.

The care of the milk teeth :—

The expansion and development of the jaw, so important to the integrity of the permanent teeth, depends largely on the amount of work the jaw does in early life, that is, whether the child is given a suitable amount of hard food and chews it. The child will not chew if the teeth are decayed and tender. In addition to this want of development of the jaw there are three forms of disorder which may be attributed to decayed milk teeth : (1) an exceedingly common form of dyspepsia due to bolting the food, (2) want of expansion of the air passage of the nose leading to the persistence of any tendency to adenoids, and (3) infection of the tonsils with enlarged glands in the neck. The management of the milk teeth from their first appearance is therefore a matter of the utmost importance and consists of the following measures :—

1. The provision of first of all rusks, then hard crusts, baked bread or pulled bread, and later, other food requiring mastication.

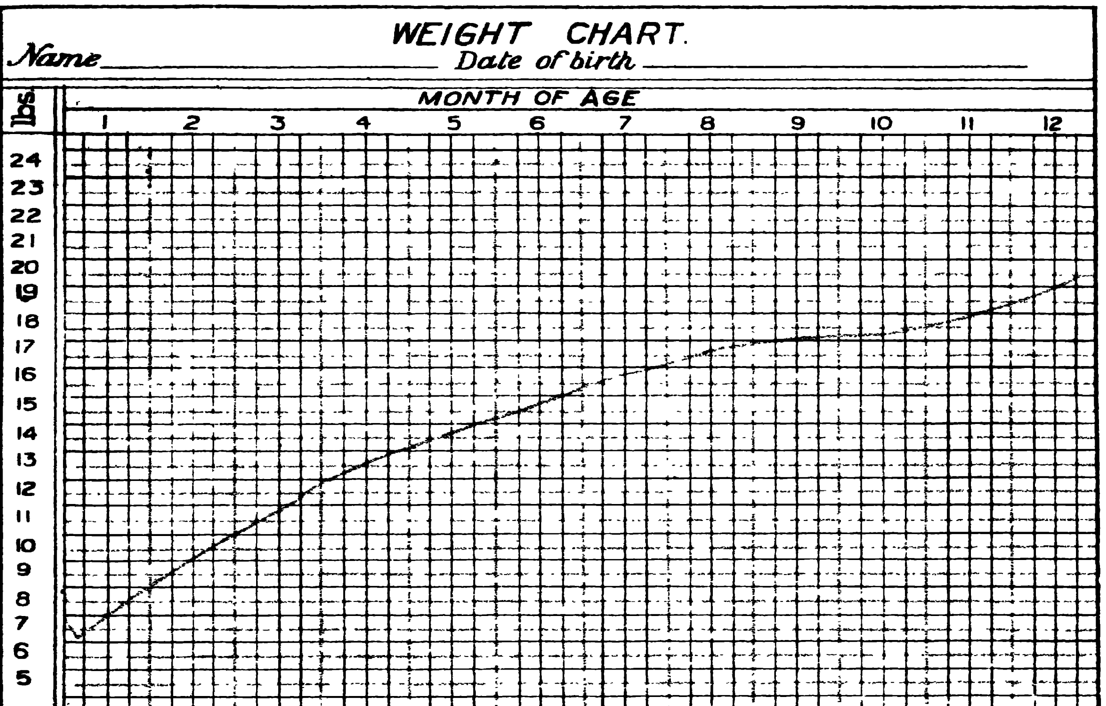
2. Careful instruction and supervision in the matter of chewing the food.

3. The child is taught to use the tooth brush early. The first appearance of the teeth is a sign for the commencement of this training and they should be brushed daily by the nurse with a suitable brush, preferably made of badger hair and as a dentifrice milk of magnesia. The child will early desire to perform this office for himself and should be encouraged. At the age of four and earlier if there are signs of delay, decay or irregularity, the child should be taken to a dentist and hereafter every six months so that any decayed tooth can be stopped early and any irregularity corrected.

Finally, it should be borne in mind that any deviation from health, particularly in the matter of mineral deficiency—anæmia or a tendency to rickets, will impair seriously the development of the first, and through them the second teeth and so lead to a lasting disability.

HEALTHY GROWTHS.

The *weighing machine* is an essential part of the equipment of the careful mother, for by no other means can a satisfactory record of the child's progress be kept. A regular gain is more to be desired than close approximation to averages and a fitful gain or a failure to gain in weight should prompt immediate investigation.



The weight-curve of the first year (Holt)

The average weight at birth is 7 lb., and the length 19 or 19½ inches. At five months the weight is doubled, and at a year is nearly trebled. The following is a table of average heights and weights for ages :—

Age.	Height.	Weight.
At birth ..	.. 19½ inches ..	.. 7 lb. 8 oz
„ 1 month	.. 20½ „ ..	.. 8 „ 5½ „
„ 2 months	.. 21 „ ..	.. 10 „ 4 „
„ 3 „	.. 22 „ ..	.. 11 „ 5 „
„ 4 „	.. 23 „ ..	.. 13 „ 9¼ „
„ 5 „	.. 23½ „ ..	.. 14 „ 14½ „
„ 6 „	.. 24 „ ..	.. 16 „ 3½ „
„ 7 „	.. 24½ „ ..	.. 17 „ 5 „
„ 8 „	.. 25 „ ..	.. 18 „ 10 „
„ 9 „	.. 25½ „ ..	.. 20 „ 1 „
„ 10 „	.. 26 „ ..	.. 20 „ 5½ „
„ 11 „	.. 26½ „ ..	.. 21 „ 2 „
„ 12 „	.. 27 „ ..	.. 22 „ 7 „

It is desirable that the weight should be recorded on a chart in the form shown opposite.

LANDMARKS RECORDING NORMAL PROGRESS.

6th week.—Posterior fontanelle closes.

4th month.—The infant is able to maintain the head erect without difficulty.

6th month.—Associates names with objects.

8th month.—First teeth appear.

9th month.—Sits up unaided.

10th month.—Speaks one or two words.

12th month.—Stands or walks with slight help.

14th month.—Speaks several words.

18th month.—Gains day control of the bladder. The anterior fontanelle closes.

24th month.—Gains night control of the bladder. The first teething completed.

Such developments are liable to variation but in the normal healthy child the average works out fairly regularly. If a child appears to be backward in one particular accomplishment it will be found to be in advance in respect of another so that the average is maintained.

Rate of pulse per minute.

At birth	130 to 140
1st year	120 to 100
5 years	100
10 years	boys 80, girls 90

Respiration per minute.

At birth	32 to 50
1st year	25 to 35
2 to 4 years	25
5 to 14 years	20 to 25

CHAPTER VIII.

GENERAL HYGIENE.

The general care and upbringing of the child presents more difficulties in India than in England; not only is the child surrounded by conditions of atmosphere, feeding and temperature which diverge largely from those natural to him by inheritance, but also he has to be guarded against diseases which, owing to poor sanitation, climate and the prevalence of insect pests, present a more constant menace than can be experienced in more temperate climates.

Clothing.—The problem of suitable clothing for infants and young children in the tropics is by no means easily solved; on the one hand, there is the risk of overburdening the child to its consequent discomfort and lack of vigour; on the other, there is, in the climate of India, with its constant changes, the danger of chill. In temperate climates all measures are taken with the object of keeping the body warm, and for this purpose woollen materials, being the worst conductors of heat, are chosen for the more important garments. In India, however, during the greater part of the year, opposite conditions prevail, the object becomes therefore rather to discourage the retention of heat and to offer no obstruction to the evaporation of perspiration, the process by which the excess of heat in the body is dissipated. In the choice of materials for the hot weather, we shall avoid those which take up perspiration and in doing so become sodden, notably woollen garments and make use of lighter materials, linen or cotton, which are less irritating to the moist skin and are capable of taking up the perspiration quickly and, at the same time, allowing it to evaporate. Perhaps the most suitable garments are those woven in cellular form, which are absorbent and allow free ventilation. Such clothes must be loose, particularly round the neck.

Danger of chill.—At the same time, there is the danger of chill; the sun goes down, an evening breeze rises, or the child is exposed to the draught of the punkah, which causes a rapid evaporation of perspiration-soaked garments and an excessive chilling of the skin. The overloading of the child with heavy garments during the heat of the day or during active exercise will not guard against this danger, rather will it be increased; the safe course lies in the provision of *loose light clothes which*

can be supplemented by additional garments of warmer material, as the alterations of temperature demand or the activities of the child are lessened. Small babies perhaps more than older children suffer from overclothing in the heat; long clothing is not to be recommended after the first few days, rather should the legs be left free to move, while the feet are kept warm by socks.

Night clothing.—At night, allowance must be made for the abrupt drop of temperature which is almost invariable in the early hours of the morning, night clothes are best made in one piece of light flannel or silk and wool, and if the child sleeps under the electric fan, a soft woollen body belt, reaching from the nipple to the hip bone, should be worn in addition.

During the rains, special care is needed, the atmosphere is so saturated with moisture that perspiration remains undried, and the garments become sodden. It is to be remembered that it is in the hot moist atmosphere, when there is little or no cooling by evaporation, that heatstroke occurs.

The climate of India is not, however, invariably hot. In the North in winter, the cold is far more intense than that felt in England. In this connection a word about the so-called process of hardening a child is not out of season. Children who are somewhat debilitated after the rigours of the hot weather will be more sensitive to the cold and require greater protection, and yet, how often one sees children on the coldest days, or in the chill breeze after sundown, with the greater part of the legs and thighs exposed. The practice is often rendered more unreasonable by swathing the body in heavy garments, that is to say, at rough estimate, some three-fifths of the skin surface is overloaded while two-fifths is bare.

The methods of the Indian dhobi are not those of a sanitary laundry, clothes are not disinfected by boiling, they are washed in open pools or streams, often of doubtful cleanliness. They are stored in unsanitary surroundings, clean and dirty clothes together, often in the hut used as a living place by the dhobi and his family, and are in fact liable to any form of contamination. Mothers should therefore *arrange to have all washing for the children carried out under household supervision.*

Exercise.—From birth, the baby requires minor degrees of exercise to enable him to acquire control and use of the muscles and to stimulate respiration, circulation of the blood and all the vital processes of the body. In early days, such exercise is obtained by crying, during the bath and during the handling incidental to nursing and attendance. Later, the baby makes more constant movements of the arms, legs and body, and, after some months, gains control of the limbs to the degree that he can

grasp such objects as come within his reach and attract his attention. Such movements should not be hampered by long clothing and after the third month a bright woollen toy or rattle may be suspended within the child's reach, taking care that it is not close enough to the eyes to cause squint, so that he may make efforts to grasp it and so acquire control of the arms and the ability to locate objects.

During the earliest days, it is customary to refrain from lifting the child from the cot except for purposes of feeding and attention or for the relief of discomfort, lest he acquire bad habits and refuse to lie quietly, though even at this stage periodic change from side to side is desirable and the cot is moved about from place to place or the baby is put to sleep in the perambulator out of doors.

Later, at 3 to 4 months, the baby is carried about at regular intervals, so that, by change of position and gentle movements, the circulation of the internal organs and the general muscular development is promoted. The child is held in a sitting position on the nurse's arm, with the back supported by the hand, and frequently changed from side to side, so that there may be no risk of curvature of the spine.

During the stage of crawling, some sort of enclosure or pen is desirable, so that the baby may be confined to that part of the floor which is specially prepared for his reception with clean rugs or mats. Some form of composition rubber flooring is admirably adapted to the baby's use, as, during the early efforts of walking, he will be saved from painful and discouraging falls. When *this stage arrives, the child should not be taught or unduly encouraged;* such exercise, before nature has fitted the bones to bear the weight, will do harm and may even produce deformities, particularly in the case of a heavy child; the child will develop the gift for himself as his confidence and desire for exploration grow.

At a later stage, boisterous play is essential to the health, by such play all the muscles are brought into action, the chest is expanded and the body becomes well-shaped. Children who are prevented from making any noise in the house, whose exercise is restricted to routine dreary walks, suffer in health and spirits. They are unable to develop the initiative and joyous outlook on life which is their birthright.

Fatigue in children comes on abruptly and with overwhelming force. The daily walk, up to the age of six years, should always be accompanied by the perambulator.

Early lessons.—The daily lessons are commenced at the age of six or seven. Like all new introductions into the child's life, the effect should be watched carefully; there is a tendency to

overburden the child in the fear that he may be backward and in the desire to prove an exceptional intelligence, with the result that the child develops a marked distaste for mental exercise. The nervous balance at this age is unstable and must not be overstrained, otherwise permanent impairment of the mental equipment may ensue. Restlessness during the sleeping hours, the development of irritability, or of lack of zest for play, should be taken as indications for the curtailment of lesson hours.

Special care should be taken that *the eyes are not overstrained.*

Sleep.—During the first few weeks of life, the baby should sleep most of the time, that is from 19 to 22 hours out of the 24. After this, the hours of sleep gradually shorten so that towards the age of three months the baby remains contentedly awake for an hour or so at a time. A little later, some part of the 24 hours will be spent in self-education and amusement, but such waking hours must not be prolonged unduly by active entertainment on the part of the nurse or visitors.

The following table (Professor Still) shows the average amount of sleep required by the normal healthy child :—

At birth	21 hours.
3 months	19 ,,
6 ,, ...	16 ,,
1 to 5 years	14 ,,
5 to 7 ,, ...	12 ,,
7 to 10 ,, ...	11 ,,
Rest of childhood	10 ,,

All children up to the age of seven should sleep for one or two hours during the day, but not immediately before or after a meal. When the climate demands rising and exercise at an early hour, this rule must be extended to older children and provision made for adequate hours of sleep during the day so that the sum total may not fall short of that given in the table. During an Indian hot weather the hours of sleep should be so arranged as not to interfere with the daily outing during the cooler part of the day. All children should be sent to bed early so that they may be up and out betimes in the fresh morning air, but before going out they should take a light breakfast. In the case of delicate children or those disinclined to feed at such an early hour, discretion must be used, as exercise on an empty stomach may prove exhausting.

During the evening outing especially, care should be *taken to prevent chill,* and a woollen wrap be added to the clothing as soon as play is finished or when a cool breeze springs up at sundown.

When possible, children should sleep in upper rooms, these rooms must be well ventilated and the child guarded against mosquitoes or flies, not only at night, *but in the daytime.* The close fitting mosquito-net prevents adequate ventilation, the child is apt to lie with the limbs up against the net and so get bitten. Some form of frame net or miniature mosquito room is to be preferred.

The arrangement of the fan or punkah calls for consideration. While it is undesirable to shield the child from all currents of air which make life tolerable during the hot weather, he should not be exposed in light, probably damp clothing, to the full force of the blast. On the one side, there is the risk of chill; on the other, restlessness, lack of sleep and prickly heat.

Sunlight.—In the hot weather, the European child is, of necessity, confined to the house during the greater part of the day, but when temperature permits, the waking hours should be spent as far as possible on the verandah. There are many parts of India where this is not feasible, the house is shut up, to some extent darkened, and the child is in danger of suffering from want of sunlight and fresh air. *Sunlight is essential to the well-being of the child, to the promotion of growth and the prevention of rickets, especially in India where the food is apt to be deficient in growth promoting and antirachitic properties.* At the same time, exposure to direct sunlight is safe only in the early hours of the morning and in the evening, but much value may be derived from reflected light on the verandah. When exposed to the sun, the child's head and particularly the eyes must be well shaded. Of late years, there has developed an increasing appreciation of the value of open air to even the youngest infants. It has been realised that a slight current of air on the face of the young baby is a direct and essential stimulus to the vital processes. The average healthy infant spends, when weather permits, the day out of doors in some sheltered spot in the perambulator.

The inspection of the open air ward of any institution for infants will convince the doubtful as to the value of this form of management.

Care of skin.—The care of the skin is not the least important item in the management of children. The skin in tropical climates is more active in the elimination of waste products and such products must be removed by bathing. Owing to its inevitable moisture, it is apt to become sodden, especially in folds and the continued perspiration gives rise to *prickly heat,* which in its turn may be seriously infected by scratching.

In hot weather, the child should be bathed twice a day in warm or tepid water, and, if there is much irritation of the skin, sodium bicarbonate in the proportion of one large teaspoonful to a gallon of water may be added to one bath daily. In sickness, it may not be desirable to bathe the child, but the whole body should be thoroughly cleansed by sponging at least once a day.

After the bath, the water should be mopped rather than rubbed off with an absorbent towel and the process of drying be completed by the application of talc powder of a standard brand. Special care should be exercised in the case of fat infants that the skin in the folds or in the napkin area does not become sodden or irritated. As has been said above, *when there is prickly heat, the skin is likely to be infected by scratching,* for this reason it is advised that the tips of the fingers be disinfected with tincture of iodine at bedtime and the nails be kept short.

Sleeplessness.—The causes of sleeplessness in infancy and childhood may be inherent, that is to say, connected with the nervous constitution of the child and in some cases can only be explained by stating that the child is highly strung or that it is the result of a nervous inheritance. Such tendency to disturbed sleep may become manifest very early in life and will be followed later by other signs that the nervous system is delicately balanced. On the other hand, the majority of cases of disturbed sleep will reveal some cause, it may be external, or it may lie in some deviation from the normal state of health.

The majority of young babies will sleep for from six to seven hours consecutively at night, unless disturbed by some accidental cause, such as a wet napkin or flatulence. *If the baby wakes frequently, we first think of the possibility of hunger* and a careful estimate is made of the food taken against the amount required. It is undesirable to encourage the habit of night feeding; some babies may be pacified by a drink of sweetened water, but it is to be remembered that *rules for the management of infants are made to suit the infants and not the infants to suit the rules.*

Restlessness and sleeplessness of infants again may be the result of incorrect early training, of picking up when the child cries or irregular hours of feeding. There may be digestive or other source of discomfort militating against undisturbed sleep.

Sleeplessness in older children may be induced by discomfort, too many or too few bedclothes, lack of ventilation, excess of heat in the room, or noises slight possibly and insufficient to disturb the average child, but enough to wake the susceptible.

On enquiry there may be found to be errors in the day's routine, commonly there is overfatigue and sleeplessness, only noted after the lessons have begun. Again the child may spend the last waking hours of the day in occupations of too exciting a nature, so that at bedtime he is thoroughly "worked up" and cannot drop off to sleep. The evening meal, if given too late, will cause disturbed sleep and, again, the child may sleep so long in the daytime that he becomes wakeful at night.

The child should not go to bed hungry, but be given a light meal unstimulating to the digestion, such as jelly and biscuit or Benger's food. Finally, the cause of sleeplessness may be found in some deviation from health. During teething, partly from discomfort, partly from the increased nervous excitability at that time, sleep is apt to be broken. Indigestion is a potent cause and may give rise not only to lack of sleep but to disorders such as night terrors or somnambulism. Other causes are to be found in enlarged tonsils and adenoids which prevent adequate oxygenation of the blood during sleep and force the child to sleep with the mouth open. Prickly heat or other source of irritation, decayed teeth, earache, cough or intestinal worms may also cause the same trouble.

In all acute illness the sleep is broken and it will be necessary to take steps to secure rest by measures promoting the comfort of the child, warm sponging, cool applications to the head and possibly sedative drugs.

In general, the use of *sedative drugs should be confined to those cases in which there is definite evidence of undue nervous excitement*, as in the period of teething, in acute illness or pain. In such cases, a mild sedative such as the following:—phenazone gr. 1, sodium bromide grs. 2, glycerine minims 10, camphor water to one drachm, one drachm to be given at bedtime will be found useful. In more obstinate cases a combination of chloral and bromide may be effective [*see* prescription No. 25(*a*)].

Opiates should be reserved for those cases in which there is definite pain, and then given with the greatest caution and *only under expert advice.*

Night terrors.—Children not infrequently suffer from nightmare and wake up screaming with fright. The attack generally starts an hour or so after the child has fallen asleep; he starts up apparently half awake, screaming with terror, speaking of imaginary objects or persons and is with difficulty roused to recognise those around him. The attack lasts from a few minutes to one hour and the child then drops off to sleep, waking next morning without any recollection of the occurrence.

Of a somewhat similar nature is the habit of *sleep-walking* or somnambulism, management and treatment are similar in both cases.

Such disorders are encountered in children of nervous tendency or inheritance and will be induced by a variety of causes, many of which, in the less sensitive subject, would not produce such effects.

Of the immediate causes to be investigated, the most prominent are :—*digestive disturbances, intestinal worms, the irritation of undigested matter in the intestines,* such as may be induced by a diet containing coarse porridge, jams with pips or other substances holding a harsh indigestible remnant, *school strain or nursery strain.* Fortunately, all wise parents have now realised the danger of allowing children to be frightened by injudicious threats, but few of an older generation cannot remember nightmares founded on some terror suggested by the nurse.

Sir James Goodhart has pointed out the frequent association between night terrors and rheumatic pains, a point not to be overlooked in the investigation of the case.

The outlook is good if proper care be taken and the treatment may be summed up as follows :—

1. Strict attention to the diet, the correction of dietetic errors or of indigestion. The last full meal is taken not later than 5 p.m., and only a light supper on the lines suggested on a previous page is taken at bedtime.

2. Thorough ventilation of the bed-room, the provision of a night light, and the nurse sleeping in an adjacent room within call.

3. Avoidance of physical and mental strain, or late hours.

Nervous children should be protected from those things which are likely to upset them, unpleasant sights or sounds, dark rooms, alarming stories.

In some cases a few nightly doses of bromides will be of value.

Bedwetting.—In connection with the disorders of sleep, the subject of bedwetting or nocturnal enuresis is not out of place, as the habit is frequently associated with other nervous disorders of sleep, night terrors or somnambulism.

The habit of bedwetting may be a failure to gain that control which should normally be established between the ages of 18 to 24 months, or it may be a loss of control after complete establishment, usually supervening between the ages of five and eight, in the nervous child, as the result of some mental overstrain, or some intestinal irritation, particularly owing to the presence

of threadworms. Other cases may be due to increase in acidity of the urine, or from excessive amount of urine, such as may occur from too fluid a diet or the drinking of large quantities of water.

When the urine is perceptibly increased in amount, special investigation should be made as to the presence of diabetes. Again, rarely bedwetting may be the nocturnal manifestation of an epileptic fit.

The habit is, in many cases, with difficulty controlled, and the response to treatment not uniform, but few cases persist beyond puberty.

It is first and foremost to be remembered that the *condition is associated with the nervous temperament* and that measures of tactful encouragement rather than punishment or repression are necessary. The child should take no fluid late before bedtime and should be taken out of bed once or twice during the night to pass water. On each occasion he should be thoroughly roused so that the act may be wholly voluntary.

If some local cause, such as high acidity of the urine, be found, the effect of doses of sodium bicarbonate, sufficient to render the urine alkaline as tested by litmus paper, may be tried. Threadworms are treated as detailed in Chapter XV.

Of medicinal treatment, belladonna has proved most generally useful, but the treatment must be carried out over long periods and the doses required are so high that they can only be administered under expert advice. Children are naturally tolerant to belladonna, but the tolerance varies with the individual and in India there appears to be a special tendency to the development of a rash. It is therefore advisable, after the age of two, to start with 3 minims three times a day and increase until some 10 minims of the tincture are taken thrice daily or till some signs of intolerance become manifest.

Good results have been obtained from ergot, for a child of five years minims 10 of the liquid extract in water thrice daily. For highly nervous children, bromides as in prescription No. 25 may be given with advantage.

At the same time, the general health of the child must not be neglected, fresh air, freedom from the strain of lessons, school or overfatigue and a suitable tonic, are indicated.

For those rare cases in which the quantity of urine voided is habitually excessive, tincture of valerian 10 to 15 drops in water thrice daily for a child of four, is likely to prove serviceable.

Masturbation.—This is a habit not infrequently encountered in early childhood. Before the fifth year the habit is seen more frequently in girls; after that age it is more common in boys.

The method usually employed by girls is leg rubbing or friction is made against the edge of a chair, toy, or pillow. Manipulation of the genitals is more common in boys. Such habits are often involuntarily set up in the attempt at relief of some local irritation, in girls vulvitis, in boys a prolonged or adherent foreskin.

It is desirable that parents should be aware of this habit and take prompt steps to check it. Early recognition will save much difficulty in treatment as, once the habit has become well established, it is with difficulty broken.

Treatment consists primarily in removing the exciting cause, be it vulval irritation or adherent foreskin. The question of circumcision must be approached with caution; the total operation exposes the sensitive glans to irritation and may only serve to make matters worse. It is better, when possible to break down adhesion, and should the foreskin be too long or the opening too narrow, a partial removal is performed whereby daily retraction is rendered possible and, at the same time, the sensitive glans is not deprived of its natural protection.

Of medical treatment, bromide and belladonna mixture (No. 7) is of value. *Much will depend on the tactful handling of the child by parents or nurses, punishment is of no avail, rather it is a case for reasoning and encouragement; particularly must the idea be discarded that this habit is an indication of moral depravity.* In older children suggestional treatment is likely to be of most value. The child should be assured that if he abstains he will suffer no ills from the past habit and will grow up strong and well. Early rising, exercise with entertainment and companionship are essential. The bowels must be regulated and an iron tonic given if anæmic. The attitude of the parents and nurse must at all costs be firm, instant and unemotional, the least attempt at the act being stopped at once and treated as a breach of good manners. As the act is performed more often in the day, mechanical restraint is not likely to be of great value. When necessary, take great care that any appliance, tapes, belts, etc., do not endanger the life from strangulation.

CHAPTER IX.

THE PREVENTION OF DISEASES.

The contrast between ordered urban life in England and life in India is nowhere more striking than in the matter of sanitation. In England, the health authorities carry out their duties in so precise and automatic a manner that the process is almost imperceptible; not only is there prompt disposal of refuse, there is legislation to secure pure food, the water supply is above reproach and infectious disease is checked and isolated. Every member is compelled to abide by certain laws safeguarding the health of the community. The mother of children will only appreciate such benefits when she arrives in India. It is true that here also there are sanitary laws and gallant efforts to stamp out disease, but these efforts are to some degree frustrated by the ignorance and apathy of a large portion of the community; even in the household there may be servants who cannot or will not understand the ordinary rules of cleanliness and health and who may jeopardise the safety of those whom they otherwise devotedly serve. The housewife, therefore, if she is to guard her children against the diseases which threaten them in India, must constitute herself household sanitary inspector and must be aware of the manner in which disease is carried and of the points at which the surroundings of the child are most open to attack.

The common infectious diseases of children of the order of measles, mumps and chickenpox appear to be less common in the plains of India during the hot weather, but in the cold weather or in the hills, where children congregate in numbers or in schools, widespread epidemics are by no means an unusual experience and, as is the case in England, an epidemic of one kind of disease is often closely followed by that of another. Scarlet fever stands out as a notable exception, the disease appears occasionally in hill schools or institutions, but does not spread widely and is not usually severe. Rarely, isolated cases are seen in the plains but they do not seem to be even infectious.

In addition, there are other communicable diseases, not necessarily all peculiar to the tropics, but more prevalent and often more severe, which are classed as preventable, a somewhat sanguine term but implying that the diseases are of known origin, cause, and methods of transmission, and that if one of these

diseases should occur, it is due to some breakdown of the sanitary precautions which should constitute a safeguard.

All communicable diseases are transmitted by germs, a term sufficiently vague to cover all varieties of organisms immediately instrumental in the production of disease.

Transmission of diseases.—The paths by which these germs leave the body of the sick person and are conveyed to the body of the fresh subject are varied and depend partly on the nature and situation of the disease and partly on the nature of the germ.

The germ leaves the body of the infected person either by some discharge, it may be mucus from the nose, throat or lungs, expelled by breathing, coughing or sneezing; it may be the discharge from an open wound, or it may be in particles shed from a skin eruption as in smallpox and chickenpox. Again, in those diseases affecting the bowels, germs will be discharged from the body with the fæces and often with the urine; particularly is this the case with water-borne diseases of which cholera, typhoid fever and dysentery may be taken as examples. Yet again, the germ may be circulating in the blood and be removed therefrom and transferred to others by biting insects.

The portal of entry into the new subject varies according to the species of the disease. Germs may be inspired and find lodgment in the nose, throat, or air passages; they may be swallowed with food or they may be conveyed to the broken surface of the skin by soiled fingers, flies or in dust. Lastly, germs may be introduced into the circulation by biting insects.

DROPLET INFECTION.

Most of the commoner infectious diseases to which children are subject are borne from the infected person to a healthy individual in the imperceptible droplets of moisture which are exhaled in coughing, sneezing or even during talking or breathing. Examples of such transmission are found in the common cold, influenza, the infectious diseases of childhood including even smallpox and chickenpox, though in the case of the last two named diseases, the infection may also be conveyed through particles of skin or crusts cast off by the patient. The infection of tuberculosis is also conveyed in this as well as in other ways.

WATER-BORNE DISEASES.

This group, especially important in the tropics where the water-supply is frequently contaminated, includes such diseases as *cholera, dysentery and typhoid fever.* Water, therefore, not only for drinking purposes, but also that used for washing all food vessels, should be the subject of the closest scrutiny. *Water*

should invariably be boiled, filtering only may prove an added source of danger, as the filter, if not properly cared for and frequently sterilised, may prove a fertile breeding ground for germs. During times of epidemics, all water used for washing dishes and preferably that for the bath, should have added to it potassium permanganate sufficient to turn it a faint pink or some form of chlorine disinfectant, such as bleaching powder solution, chlorogen or Milton.

Wells.—A few words may be added as to the care of the water supply if it is obtained from wells and not from stand-pipes. The well should have a sound protecting wall and concrete platform; no animals should be allowed in the vicinity and servants should be forbidden to mount or do any washing on the plinth.

The well-cover should be mosquito-proof and all unused wells in the compound should be filled in or sealed so that they may not become breeding places for mosquitoes. Care should be taken that the lining is sound enough to exclude surface water.

Wells are often infected by contaminated ropes and buckets, especially if persons from inside and outside the compound are allowed to use their own. Only one rope and bucket should be permitted and that should be cleaned periodically by soaking in a solution of permanganate of potassium or bleaching powder and they should further be carefully stowed in a clean place at night.

The well from which the household supply is drawn should periodically be emptied completely and the sides washed with a freshly made solution of lime made by slaking fresh quicklime with water and mixing with four or five parts of water.

FOOD-BORNE DISEASES.

The food may become infected in several ways, by handling with dirty fingers, by flies, by exposure to dust and dirt, by washing in impure water or the food itself may be actually diseased. Food, sterilised by cooking, may become reinfected by exposure to dirt, dust and flies.

The management of certain foods demands special mention.

Milk.—Milk, owing to its properties as a culture medium for the majority of germs, possesses the undesirable quality of transforming what may originally be a low bacterial contamination into a very high one in the course of a few hours. Further, in the course of collection it is liable to contamination at many points, all of which will require special attention if the milk is to be kept up to the necessary standard of purity. The udders of the cow may be diseased or dirty, contamination may come from the hands of the milkman, from hair or particles of dirt

falling into the pail from the coat of the cow, from the ill-kept cow-house and from unscoured pails. All vessels used in transport should be scoured with boiling water immediately before and after use, and should be provided with an air-tight lid and lock. *All milk must be sterilised,* bazaar milk is inadmissible for the nursery. Where there is no dairy under responsible supervision, we must rely on the home-fed cow, kept under strictly hygienic conditions (*see* also Chapter VIII). Milk must be kept in a cool place protected from flies.

Meat.—Three points are of special importance, firstly, that meat must be guarded against contamination by flies which alight indiscriminately on filth and food; secondly, that even cooked meat is liable to rapid putrefaction, and that the products of such putrefaction may produce poisoning; and thirdly, that meat, especially pork and beef, may contain the living larval form of tapeworm.

Vegetables.—Uncooked vegetables are unsafe unless grown on the premises and under supervision. Often they are watered with sewage water or the soil is fertilised with animal manure. Further, they may be soiled with the excreta of domestic animals and so convey intestinal worms.

Certain fruits such as oranges and bananas are supplied by nature with an impenetrable envelope, so that the contents remain sterile. The envelope should be thoroughly washed before removal. Thin-skinned fruits such as grapes from an unknown source are best avoided.

No article of food, intended for use uncooked, which has been exposed for sale in the bazaar, should be admitted to the nursery. Such articles as sugar should be purchased in sealed bags. A brief inspection of the average bazaar will convince the purchaser of the desirability of this precaution.

INSECT-BORNE DISEASES.

The study of tropical disease has revealed the part played by insects in the conveyance of many other forms of disease. The two insects which we regard specially as natural enemies are the *fly and the mosquito;* the former is, perhaps, responsible for more disease than any other agent in that it *establishes direct communication between every form of filth and disease and the body or food of the healthy.* Particularly active is the fly in the propagation of such diseases as *typhoid fever, dysentery, summer diarrhœa or cholera.*

The mosquito is familiar to all as conveying malaria and dengue and may be responsible for certain forms of blood-poisoning. Filaria, the disease resulting in elephantiasis, is also

borne by the common brown mosquito (*Culex fatigans*) but this disease is not seen in children.

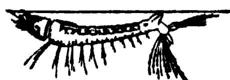
Malaria is commonly a disease of the country or rural areas but it is also common in large towns like Bombay or Calcutta where the Anopheles mosquito breeds freely in wells and in uncovered water systems which should therefore be strictly covered.

The principles of *prophylaxis against malaria may be* summarised as follows :—

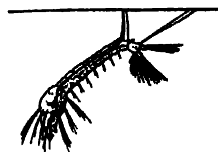
1. The destruction of breeding places.

The Anopheles mosquito lays its eggs in water, preferring slow-moving or standing water, sheltered from the wind, in which vegetation is growing. Other breeding-places are formed by any receptacle in which rain water can collect and stand. Fire-buckets, unless the water is changed freely, form a fertile breeding place. The eggs grow into free-swimming larvæ, minute active creatures that may be discovered in any standing water. Their appearance, as well as that of the mature insect, is shown in the diagram. The distinctive position of both the larvæ and insect from that of the Culex or comparatively harmless mosquito should be noted. Pools, ponds, or streams should be cleared of surrounding vegetation and, if possible, drained. Failing this, they should be treated with kerosene oil, which forms a thin film on the surface whereby the larvæ are suffocated.

ANOPHELES. CULEX.

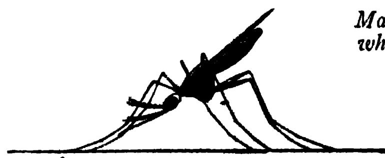


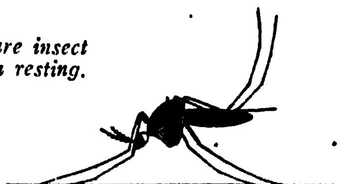
Larval form.



Parallel to water surface. At an angle to water surface.

Mature insect when resting.





Body straight and stands at an angle. Body curved and parallel.

2. The destruction of mature insects.

The mosquito is an insect of dark places and will haunt close vegetation round the house or rooms into which light is not

admitted. Such haunts should not be permitted. The spraying of inevitably dark places, with an insecticide such as Flit or Shelltox or the burning of *loban* will do much to drive the pest from the house. Low sofas and chairs should be moved and cleared daily. It is curious that the mosquito-proof room, which adds so much to the amenities of life, should be of such rarity in India.

3. The mosquito is not capable of transmitting malaria unless previously infected by biting a person actually carrying the organisms in the blood-stream. The mosquito must therefore be prevented from access to such persons, by protecting them with mosquito nets and further by treating malarious subjects actively so that they cease to be a source of infection.

4. All persons in a malarious locality should sleep under mosquito nets. Infants should be carefully guarded at dusk and if the room is darkened during the day, the net should again be used. It is convenient to have some form of mosquito-proof cage, sufficiently large to admit the cot and to permit the nurse to enter and attend to the child. Care must, of course, be taken that mosquitoes are not included in the net when it is put down.

For older children, there is a period of danger at dusk before bed-time, at such times the legs should be protected and, in highly malarious localities, the only real safeguard is a mosquito-proof room.

OTHER METHODS OF SPREAD.

Infectious disease may also be carried by inanimate objects which have been used by the sick, in the clothing of the attendant or by carriers, that is, healthy persons, themselves immune or recently recovered, who still harbour active disease germs. Special reference to carriers is made in the chapters on diphtheria, typhoid fever and dysentery. The practical application lies in the examination of all persons who have suffered recently from diseases of the typhoid group, from diphtheria or from dysentery, to ensure that they are free from infection.

Tuberculosis.

A special word on the subject of tuberculosis, to which children after the age of one year are especially susceptible. The susceptibility is increased by unhygienic surroundings, overcrowding, lack of air and sunlight, and impaired health from any cause, but particularly if induced by measles or whooping-cough. The child is open to infection by bacilli either from cattle tuberculosis which, being discharged from the diseased udder into the milk, are swallowed, or from human tuberculosis, by contact with those infected, by inspiring dust containing the bacilli or by swallowing

food similarly contaminated. The campaign against spitting in public places, instituted at Home, should do much to reduce the incidence of this disease. In view of the susceptibility of young children, they *must be safeguarded against infection,* cattle must be the subject of frequent inspection for signs of disease, milk must be sterilised and the child rigidly excluded from contact with persons known to be the subject of tuberculosis. Though the disease is rife among the Indian population of large towns, it is rare in European children, owing to better sanitary conditions and an appreciation of the necessity for free ventilation and light.

SANITATION OF THE HOUSE.

It now remains to mention a few special points in connection with the sanitation of the house.

The kitchen should be near the house, it should be well ventilated and provided with fly-proof doors and windows. The floor, of sound cement, is washed down daily. The walls should be whitewashed at intervals, the shelves scrubbed and, if paper covered, the paper should be renewed every few days. The cooking pots must, of course, be clean and free from grease. The best utensils are enamel. Commercial aluminium is not always reliable and brass utensils, unless frequently retinned, are liable to give rise to poisoning. The kitchen table must be scoured daily with boiling water and special attention should be paid to the chopping board, which requires replaning as soon as it becomes cut up.

The cook's clothing must be clean and a cupboard for the reception of his outdoor clothes supplied. A basin and soap should be supplied for his hands and there should be no lack of clean dusters. The surroundings of the kitchen will also call for inspection. The sullage water drain must be accurately placed so that it leads into a suitable receptacle without soiling the ground, this receptacle being cleared regularly and no overflow allowed. Flies tend to swarm round these receptacles unless they are well tarred and supplied with a properly fitting lid.

Finally, the cook should be discouraged from accumulating oil tins and receptacles on the shelf and from keeping flavouring essences or other condiments in bottles of doubtful cleanliness and with ill-fitting corks.

Verandahs should be kept clear of vegetation, and creepers should not be allowed to overgrow and shut out light and air or form a refuge for mosquitoes.

The *bath-room* floor should be well cemented; the drainage vent, guarded with fine wire net, should communicate with a well-constructed drain and not pour into a soakage pit, which will

soon be rendered foul and impermeable to drainage by soap-suds. The ceiling is often dark, with many crannies affording harbour to mosquitoes. If this is so, the roof may, with advantage, be sprayed daily with some such preparation as Flit or Shelltox. Every bath-room should be furnished with a bottle of cresol or similar disinfectant.

The *servants' quarters* should not be too near the house. They not infrequently constitute the one menace in the otherwise perfectly ordered household. They are dirty within and the surrounding ground is littered with refuse. A strict watch should be kept on the number of the inhabitants of the godowns. It is desirable that house servants should reside within the compound, and they must be allowed to keep their families with them, but it is not necessary to accommodate all their relations and cattle. This point becomes of especial importance during the time of epidemic lest the householder find herself acting host to refugees from a stricken area. No servant or member of his family should be allowed to lie sick in the quarters; he should be sent to hospital and, if suffering from an infectious disease, not permitted to return till certified as free from infection.

The *servants' latrine* is a point of special importance and should be inspected daily. Scrupulous cleanliness is necessary and the receptacles after being emptied should be washed with a solution of phenyl and then wiped with a rag dipped in crude oil which is the best agent for keeping off flies.

Reference has been made to the dhobi, in the previous chapter, in connection with the clothing of children. A well-constructed dhobi ghat is a valuable adjunct to the compound.

In the early and late rains, the compound should be inspected with regard to the drainage of rain-water. No standing water should be allowed to form a breeding place for mosquitoes.

Finally we have a potent auxiliary in protection against certain diseases in vaccination and inoculation.

VACCINATION AGAINST SMALLPOX.

It is not necessary to formulate a defence of vaccination in spite of the views advanced by ill-educated and foolish persons. Every child in India must be vaccinated at the earliest possible moment. If this precaution is neglected he is subject to a grave risk of contracting smallpox, which is virulent and prevalent.

1. The first vaccination should be carried out within the first fourteen days of life unless there is some distinct contra-indication such as fever, severe illness or skin rash. To put off the operation on account of the hot weather is not justified. Should

the first attempt prove unsuccessful a second and if necessary a third attempt should be made.

2. Revaccination after a fully successful first vaccination need not be done for five years.

3. If a person be vaccinated or revaccinated within three days after exposure to the infection of smallpox, the protective power of the vaccination will be exerted and the person so exposed will probably escape the disease entirely, because the incubation period of smallpox is twelve days and that of vaccinia only eight, and the latter thus anticipate the former.

Method.

The skin should be cleaned first with rectified spirits and then with boiled water. The site usually chosen is the outer side of the upper arm, but for a girl the calf or outer side of the thigh is preferable. The scratches should be made parallel and not crossed. Three or four marks should be made not less than one inch apart and about ¼ inch long and the lymph, which may be obtained in sealed tubes of lead or glass, applied with the lancet and gently rubbed in.

For the scarification of the skin a number of appliances have been invented, but in the opinion of the writer the ordinary vaccination lancet or small scalpel is the most satisfactory. The object is to penetrate the deeper layers of the skin so that blood just begins to ooze and no more. More copious bleeding is apt to stultify the result. The lymph must be allowed to dry thoroughly and should not be exposed to the sun before a protective dressing of sterilised unmedicated gauze has been applied. After this the limb should not be allowed to be wetted by the bath water until complete healing has taken place.

Signs of successful vaccination :—

After three or four days one or more hard red papules appear. On the fifth day a clear blister appears in the centre of the papule, this becomes pitted in the centre as it enlarges and surrounded by a swollen red area known as the areola. By the seventh day the vesicle has attained its full size. On the eighth day the contents become yellowish and the areola is more swollen, red and tender. About the tenth day the areola begins to fade and the central pustule begins to dry up forming a scab which falls off about the twentieth day, leaving behind the vaccination "mark" which remains more or less permanent throughout life. If there is no sign of a vesicle in 10 or 12 days after the first vaccination, the operation should be repeated.

There is a certain amount of constitutional disturbance in every case of successful vaccination, but *the younger the baby,*

usually the less it is. Symptoms are rarely severe for more than three days, unless there is great or unusual inflammation of the arm.

After revaccination the local signs may be the same as for primary vaccination or milder reactions, a slight hardening, reddening and the formation of minute vesicles, which quickly disappear, may be all that is seen.

INOCULATION AGAINST TYPHOID FEVER.

(The attention of Indian mothers is especially drawn to the following section, as the disease is exceedingly prevalent among Indian children).

It is fortunate that nowadays an inoculation against the typhoid group of diseases, typhoid and paratyphoids A and B, is considered part of the equipment of those who visit the tropics but it is to be regretted that the reinoculation, which should take place every two years, is often neglected. To abstain from inoculation is to refuse protection against an infection which has so many paths of attack that it constitutes a real danger and many have had occasion to regret bitterly the neglect of this precaution. Occasionally severe constitutional reactions arise but they are not dangerous, though painful.

It is unusual to inoculate children under four years of age; after that age the dose is as follows :—

Age	1st dose.	2nd dose. after 10 days
4 to 6 years	0.15 c.c.	0.3 c.c.
6 to 8 „	0.2 „	0.4 „
8 to 10 „	0.25 „	0.5 „
10 to 12 „	0.3 „	0.6 „
12 to 14 „	0.4 „	0.8 „
Over 14 „	0.5 „	1 „

Standard strength—B. typhosus 500 millions, B. paratyphosus A and B each 250 millions per cubic centimetre.

In the case of delicate children the inoculation should be performed in three stages, the first dose should be half the usual initial doses and the subsequent doses as laid down for normal children. Asthmatic children should be first tested as to susceptibility by the administration of one minim only.

CHOLERA INOCULATION.

This vaccine has been administered to thousands of children in times of epidemic without harmful results and with assured

protection. It is unusual to inoculate children under four years. The adult dose of standard vaccine (i.e., 8,000 millions per c.c.) is 0.5 c.c. first dose and 1 c.c. the second dose ten days later. Doses for children are estimated as for typhoid inoculation.

DIPHTHERIA PROPHYLACTICS.

Two forms of inoculation against diphtheria are available; the first, passive immunisation obtained by the injection of a small dose of a diphtheria antitoxin, say 1,000 units, to children who have been exposed to infection. This method is applicable only when it is desired to obtain immediate protection. The duration of protection is three weeks only and there is the drawback that the child may have become sensitised to serum.

The second method, by the administration of toxoid-antitoxin mixture affords a permanent protection and is now much employed in schools in India where epidemics are liable to break out. The results have been satisfactory. The dose is administered at weekly intervals to three doses and full protection is not obtained until after the injection of the third dose.

Schick test.—The Schick test was devised with the object of determining the susceptibility of the individual to diphtheria. The test has considerable practical value in detecting those, in a community exposed to infection, who should be immunised and in selecting attendants for diphtheria patients.

The test consists of injecting between the layers of the skin a small quantity of two solutions, the one a standardised fresh solution of diphtheria toxin, and the second, a control solution, for purposes of comparison; the same solution, but the toxicity destroyed by heat.

The positive reaction appears after some 24 to 36 hours and indicates that the subject is susceptible and, if recently exposed to infection, requires temporary immunisation by the injection of a prophylactic dose of antidiphtheria serum.

The tests carried out in a large number of subjects show that the numbers of those immune are as follows :—

Before the age of three months, 85 per cent. During the 1st year, 40 per cent., 2nd year, 30 per cent. Adults, 80 per cent.

The test is also of importance if virulent bacilli are found in the throat of an apparently healthy subject. A positive Schick test indicates that clinical diphtheria is about to develop and that the early administration of antidiphtheria serum is necessary. A full description of the technique is to be found in Beaumont and Dodds' "Recent Advances in Medicine".

PROPHYLAXIS AGAINST TETANUS.

Wounds if dirty or lacerated, especially if contracted through falling on the road, are a possible site of tetanus infection. It is well in such cases to administer a prophylactic dose of 1,000 units, antitetanic serum.

DISINFECTION.

The medical attendant must realise that his duties when attending a patient suffering from an infectious disease do not end with the patient. He is also morally responsible that every precaution is taken to prevent spread of the disease and for the protection not only of the other inmates of the house but also of the public at large. Such measures will consist mainly in isolation, the disinfection of all excreta, of all bedding, utensils or other material used by the patient, and the use of preventive inoculations for persons exposed to infection from those diseases for which they are available.

In former times, the end of the disease was the signal for a thorough or terminal disinfection of the room and all articles used by the patient. The more modern conception of efficient disinfection is that the process should begin at once and continued so long as the patient is a source of infection. Nothing should be allowed to leave the room until it is fully treated, whether it be the dejecta of the patient or clothing, bedding and feeding utensils.

All the excreta of the patient or stuffs soiled by the excreta should be treated immediately with raw phenyl, cresol or bleaching powder (one-half pound to the gallon, diluted one hundred times) or a chlorine solution. Nothing should be thrown down the water-closet or sink till it has been so treated for one hour, nor should soiled linen be sent to the wash till disinfected.

Clothing may be boiled having been first steeped in a solution of perchloride of mercury 1—1,000 or lysol 1 teaspoonful to a pint, or may be subjected to dry heat in an apparatus specially constructed for that purpose.

Plates, cups and other feeding utensils are best treated by boiling for ten minutes.

Thermometers should be kept in rectified spirits and soaked in this for three hours before being used on another patient.

If these precautions have been rigidly observed, there is little need for any drastic disinfection at the end of the disease. All that is necessary is the simple airing and sunning of the room. Bedding, pillows and clothing may with advantage be treated in a dry heat disinfector, or failing this should be opened up and soaked for some hours in a disinfectant solution.

Occasionally it may be desirable to make a complete and thorough disinfection. Measures may then be taken as follows:

The preparation of the room and contents for disinfection (Bentley). All openings should be closed, excepting the door. If there are any cracks, open spaces, key-holes, etc., they should be pasted over with strips of paper. Clothing, bed-covers, etc., should be removed from the bed and hung on ropes stretched across the room; mattresses and pillows should be opened up and the contents exposed. All chests, trunks, drawers and almirahs should be opened and the contents spread about the floor. As soon as the disinfectant is placed in the room, the door should be closed and any cracks or opening round it, promptly sealed.

Disinfectant to be used : formalin spray.

After fumigation, the woodwork should be washed down with soap and water, walls rewhitewashed and the room aired for several days.

DISINFECTANTS.

1. Carbolic acid, cresol, phenyl and lysol. Used in strong solution for the disinfection of excreta, bed-pans, etc. In weaker solution for disinfection of linen and other articles. Carbolic acid 1—100 or lysol 1 teaspoonful to the pint may be used for washing the hands.

2. Chloride of lime (bleaching powder). Powerful disinfectant but loses its virtues if allowed to get damp. May be used in solution of 3 ounces to a gallon for utensils, sinks, etc. Is best not used for delicate fabrics.

Ordinary active quicklime, which is to be obtained almost anywhere, is a safe and effective disinfectant. It becomes slaked when water is added, swelling up and becoming hot. This slaked powder, mixed with 3 or 4 parts of water, now becomes milk of lime and can be used to disinfect privies, and any ground which has become soiled with discharge. It is particularly useful in disinfecting the floors and walls of mud huts and stables.

3. Permanganate of potash. Enough of the crystals should be used to turn the water a deep pink, the solution is only of use so long as this colour remains. It may be used for soaking feeding utensils in the sick-room.

4. Perchloride of mercury. As disinfectant for clothes and utensils, 1—1,000. As hand lotion or for bathing the patient at the end of infectious disease, 1—10,000. Highly poisonous.

N.B.—Carbolic acid and sulphurous acid gas may be used together, but neither should be used with potassium permanganate, chlorine gas or the chlorides (as chloride of lime). *All disinfectants should be regarded as poisonous.*

CHAPTER X.

EXAMINATION OF SICK CHILDREN.

The infant or young child is incapable of rendering any voluntary aid to those concerned in the maintenance of his health or in the investigation of his illness, but will nevertheless present a fairly clear picture, if all changes from the normal habits, progress and demeanour are closely and accurately observed. The habits of the infant are so simple and regular that any deviation from the normal should not pass unnoticed. On the contrary, by the correct conduct of these habits, functions and by the steady maintenance of progress, he announces the fact that he is healthy.

Of prime importance is it that the minor departures from health should be noted early; that such conditions as indigestion should not be allowed to go on until the attention is forcibly fixed by a sudden climax, the onset of diarrhœa, vomiting and fever, which is wrongly attributed to some souring of the milk or some illness contracted within the last day or two. The commoner digestive and nutritional disorders of infants and children are of insidious onset, and though they give rise to definite signs, such signs are not infrequently overlooked.

The signs to be noted may be termed negative and positive, the negative being the cessation or interruption of progress, function or habit, that is to say, failure to gain weight, to maintain the ordinary standard of progress, loss of appetite, irregularity of the action of the bowels and sleeplessness. The positive signs are numerous, the appearance is altered, the face changes colour, is pale, flushed, there are dark rings under the eyes or round the mouth; crying may be more frequent or changed in character, the child may be restless or somnolent or some special symptom, or group of symptoms such as cough, breathlessness, fever or vomiting, may lead the mother to realise that all is not well. Once this fact is suspected or established, the most minute examination and enquiry is instituted.

The mother should endeavour to be accurate in her observations, as the correct diagnosis depends to a considerable extent on her information. She has the full confidence of the child and his demeanour will not be altered by shyness or fear as it may be in the unaccustomed presence of the physician. It may be that

some symptom or group of symptoms has attracted attention or it may be that the normal functions are interrupted; whatever the manner in which the child has revealed his illness, a full investigation is essential. The *child must be considered as a whole, functionally, physically and psychically* lest the attention is unduly fixed on some more prominent symptom and the underlying cause overlooked. In young children, the effect is often curiously unsuggestive of the cause, as for example, bronchitis may be due to gastro-intestinal disorder; gastro-intestinal disorder due to nasal catarrh; headache and abdominal pain to rheumatism.

The *demeanour* of the child in sickness undergoes marked changes, babies become restless, fretful or worst of all, apathetic; older children listless, irritable and disinclined to play, the appetite is capricious or lost and the customary vigorous movements are stilled. The natural placid expression changes, the brow is puckered from headache or the face bears an expression of pain, anxiety or weariness.

The *cry* of the healthy child, loud, vigorous and strong, cannot be mistaken; it is heard at appropriate moments, when the baby is hungry, when he requires changing or suffers discomfort from lying too long in one position. The cry ceases when feeding time arrives or when suitable attention has been given. The cry becomes abnormal when it is too long or is heard too often. The cause may be found in deficiency in the food, too prolonged intervals between the feeds, some source of discomfort, or the baby may have learnt that prompt attention and petting is forthcoming in response to his efforts.

The cry of sickness is usually altered in tone, it may become the sharp scream of acute pain, the low whining or moaning of long continued discomfort, the repeated faint emotionless cry of exhaustion or the husky whispering cry of laryngitis. It is not difficult, on listening to the cry, to realise when the child is in pain, and though he is incapable of expressing in words what is the matter, his actions, expression and position will almost always reveal the site.

Colic.—The commonest cause of gusts of screaming and crying in young infants is colic. The attitude of the child is characteristic, the lower lip is drawn in, the hands clenched, the legs drawn up, the body stiffened and bowed forward. *Earache,* also common, is often mistaken for colic, but the child will rub or pluck at the ear, burrow the head in the pillow, and when the pain is severe, arch the body backwards, an attitude seldom assumed in colic.

The *site of the pain* may be revealed by the immobility of a limb such as is seen in scurvy or one of the acute joint or bone affections of infancy. When there is acute tenderness of this sort, the expression of even a young baby becomes anxious when the bed is approached, as if he feared any jar or touch.

Sleep.—Disturbance of sleep is one of the earliest and most constant signs of illness. Certain types of disturbance are characteristic, for instance, the restlessness and teeth-grinding associated with gastro-intestinal disturbance. Unquiet sleep with sudden wakings, snorings and startings is often associated with enlarged tonsils and adenoids.

The subject is more fully discussed in Chapter VIII.

Temperature.—The temperature of infants and young children is subject to variations from causes which, as age advances, cease to have any influence, and suspicion of serious illness may be aroused when the cause is, in itself, trivial. The consequence is that a rise of temperature even so high as 102° or 103°F. may be of grave significance, or it may be due to some comparatively trivial cause. Particularly noticeable is the effect of digestive disturbances, the normal daily variation is exaggerated, the temperature may remain subnormal, or the fever may be so prolonged as to lead to the suspicion of some infective disorder. Even simple constipation, especially if aided by excitement or over-fatigue, may cause the temperature to rise to an alarming degree.

A subnormal temperature must always be regarded as serious, as it is the indication of some want of vitality, a feeble circulation, insufficient nourishment or exhaustion.

The normal *pulse rate* of the infant and child is approximately as follows :—At birth, 140 to 130; 1st year, 120 to 100; 5th year, 100; 10th year, boys 80, girls 90.

The rate in fever rises with the temperature, but the proportionate rise is slight as compared with that of adults, being four beats for every degree of temperature, while in adults the rise is ten beats, provided that there is no special cause to accelerate or retard the rate.

The *fontanelle.* The anterior fontanelle is the soft space between the bones at the top of the head. Normally it is closed at eighteen months and failure to close at or near this time is indication of delay in bone formation (*see* rickets).

Before the closing of the aperture much information can be gained in sickness. Normally the fontanelle is felt as a slight depression, in fever it is apt to be prominent; in collapse, especially when associated with loss of fluid, it is sunken and in association with serious disease of the brain it is bulging and

tense. In the normal baby the pulsation of the fontanelle is not usually felt, but during fever it becomes marked and it may be convenient to ascertain the pulse rate from this source.

Inspection.—The first inspection of the sick child may reveal some signs which afford a clue, if not to exact diagnosis, at least to the general condition. With high fever, the child is restless and flushed; in collapse, the face is grey, the child is apathetic and lies on the back; with severe inflammation of the lungs, the lips are blue, the face dusky and the nostrils dilated widely with each indrawn breath. The appearance of the child, suffering from severe gastro-intestinal disease of long standing, is characteristic; the colour is earthy with the sunken cheeks and eyes of old age, the expression is weary, the face lined by deep wrinkles and the head seems disproportionately large.

Particular note must be taken of any signs of extreme nervous irritability or of impending convulsions, rolling of the eyes, squint, twitching or rigidity of the limbs, the clenching of the hands with the thumbs inside (*see* Chapter XIV).

For the rest, the following points must not escape notice :—

Immobility of a limb, indicating paralysis or acute tenderness or injury.

Twitchings or jerkings of the limbs such as occur in chorea or habit spasm.

The drawing up of the legs on the abdomen pointing to abdominal pain or inflammation. If one leg only is persistently flexed, the presumption is of abdominal inflammation on the same side, or of disease in the hip-joint.

Skin.—The presence of *œdema* if most marked on the face, is suggestive of kidney disease; if on the extremities, of extreme weakness, weakness of the action of the heart or malnutrition. The presence of skin eruptions, especially in the napkin area, scalding from diarrhœa, bruising such as may be seen in scurvy, the yellow tinge of jaundice or the brown staining at the folds of the skin, well marked over the axillæ, abdomen and groin seen in older children suffering from chronic constipation.

Discharge.—The presence and nature of any discharge from the nose, eyes or ear; in the latter case, the area around the ear is carefully examined for any tenderness which may reveal deep-seated inflammation.

The presence of any *glandular swelling,* particularly behind the angle of the jaw, is suggestive of some form of infection of the tonsils.

The throat.—Examination of the throat should never be omitted as by doing so we may overlook diseases such as diphtheria, demanding instant treatment.

THE CHEST AND RESPIRATION.

The respiration of the young child is considerably more rapid than that of the adult and is liable to variations from trivial causes. The average rate is as follows : Birth 30 to 50, 1st year 25 to 35, slowing gradually to 20 to 25 at five years.

The normal ratio to the pulse is 1 to 4 or 1 to 5, but in severe lung disease, the rate becomes 1 to 3 or 1 to 2 and the respiration rate tends to increase out of all proportion to that of the pulse. The respiration in sickness not only alters in rate, but also in rhythm. In severe *broncho-pneumonia* there are all the signs of deficient aeration of the blood and of the efforts to relieve it. The chest is distended, all the muscles of the chest and even of the neck contract forcibly in the effort to fill the chest, the soft spaces between the ribs are sucked in, the nostrils dilate widely with each indrawn breath, but in spite of this, the urgency remains unrelieved, for the face and lips remain blue. The respiratory efforts are so violent that suspicion may be excited in the mind of the observer that there is some obstruction in the throat but there will be no stridor or crowing. At the same time, the rhythm becomes characteristic. The normal rhythm of :—inspiration—expiration—pause—is reversed to :—inspiration—pause—expiration, and this pause is often made evident by an audible catch or grunt.

In *bronchitis*, the breathing is also laboured, but not to so great a degree; by placing the flat of the hand on the chest a sensation of rattling is felt. Should the expiration (out-breathing) be unduly prolonged and accomplished with visible effort in contrast to the short easy inspiration, the possibility of *asthma,* a disease to which the young are by no means immune, must be considered.

Rapid deep breathing, sometimes irregular, with no signs in the lungs or blueness of the lips is often a sign of acidosis.

In less acute cases, the chest should be examined for any characteristic change of shape, the beading of the ribs and deep grooving of rickets, the prominent breast-bone with flattening on both sides of chronic partial obstruction to respiration, as with enlarged tonsils and adenoids, or the everted lower ribs and distended abdomen of older children, the subjects of chronic intestinal dyspepsia.

The force and area of the visible heart-beat is noted. Where there is severe heart disease of old standing, the chest wall over the heart area may be seen to bulge.

ABDOMEN.

From what has been said above, it will be clear that the condition of the abdomen must be read in conjunction with that of the chest, and not only of the chest, but also of the lower limbs. In acute disease within the abdomen, the legs are drawn up to relieve tension and any attempt at straightening is resented. After the second year the abdomen should be comparatively flat when the child is on its back. Marked prominence may suggest rickets, chronic intestinal dyspepsia or constipation. The normal abdomen moves freely with each indrawn breath, but such movement is limited or stilled if there is any inflammatory or painful condition within. The movement will be also limited by over-distension, such as will occur when there is fermentation with the production of much gas in the intestines. Such limitations, even from so simple a cause as over-distension of the stomach, may lead to respiratory embarrassment and blueness of the lips.

On palpation by the hand, the abdomen should feel soft, and, provided that the child is not alarmed, there should be no resistance to gentle pressure. Localised areas of resistance or rigidity are of grave import; above the right groin it may indicate appendicitis or dysentery, on the left side at the same level, dysentery or inflammation of the lower bowel.

Visible peristaltic movements of the stomach, that is, squirming movements seen on the surface of the abdomen, should be sought in all cases of projectile vomiting, and of the bowel, when there has been prolonged or obstinate constipation. Such movements indicate that there is partial obstruction to the onward flow of the contents.

The liver may be felt about one finger-breadth below the lower rib margin on the right side in young children; in most forms of fever there is engorgement and consequent advancement of the edge. Marked enlargements will call for minute and skilled investigation. The spleen, on the opposite side, also enlarges in all forms of fever; in chronic malaria, the enlargement may be so enormous as to cause the whole abdomen to bulge, and in kala-azar, the same degree of enlargement is observed, but developing at a more rapid rate.

Finally, in investigating acute abdominal pain, it should be remembered that, owing to the distribution of the nerves, pain arising from inflammation in the chest may give rise to severe

pain in the abdomen and may even simulate appendicitis (*see* also Chapter XII).

Limbs.—The limbs should be examined for any flabbiness of the muscles or laxity of ligaments, which may lead to the early diagnosis of rickets. Before any bony deformity is noticeable, by grasping the lower leg and moving it from side to side, the upper end of the shin bone may be made to tap perceptibly against the lower end of the thigh bone.

Gait.—In older children, when the condition permits, observation of the gait, as revealing any slight paralysis, lack of control, giddiness or disease of a joint, is valuable and the *examination of the spine* for any evidence of curvature should not be omitted.

The mouth.—The examination of the *tongue, mouth and teeth* is best left till the end as it is likely to disturb the child and provoke resistance. The tongue in health is clean. A whitish tongue indicates derangement of some sort such as approaching fever or indigestion. Dark brown furring is significant of more grave disorder and when, in addition, it is dry and the teeth, if present, are covered with dry scales, the condition may be regarded as intensely toxic.

Examination of the mouth early in sickness is of value, as many of the rashes of acute fevers tend to appear here some hours or days in advance of the appearance on the skin. In addition, in measles there are certain characteristic eruptions which will aid early diagnosis.

VOMITING.

The act of vomiting is so easily provoked in young children that it is apt to be regarded as almost natural; indeed, as a rule it arises from some trivial cause, but this cause must be ascertained, particularly if the vomiting persists over more than a very short period.

An acute attack of vomiting, though commonly in response to some derangement of the stomach and often following rapidly on the obvious cause, is by no means always an indication of simple digestive disturbances; it is frequently the first manifestation of the onset of acute infectious diseases; of malaria; it may be provoked by some disorder remote from the stomach, as for example, inflammation of the ear or appendicitis, or in some children it is set up by slight emotional stress; it may even be pleasurable excitement. In fact, vomiting may be provoked by any disease and it may occur in the absence of any disease whatever. On the other hand, the nature of certain more persistent forms of vomiting is characteristic.

Posseting.—A common form of vomiting in early infancy is known as posseting, that is, the return of a small quantity of food after each meal. If the baby is held upright after feeding, to facilitate the expulsion of gas or any air that may have been swallowed, this is lessened. In some infants, it is an indication of excess in the size of the feed, but in others, it would appear to be due to want of control over the stomach.

Apart from this, persistent vomiting in young children must be regarded as of serious import, till the contrary be proved.

The nature and amount of the vomited matter will sometimes throw some light on the underlying condition and should be kept for the doctor's inspection. The appearance of streaks of blood during the course of violent vomiting is not unusual and need cause no serious alarm.

Rumination.—Some children have acquired the unpleasant accomplishment of returning food from the stomach at will. This may take the form of rumination, when a small quantity at a time is ejected into the mouth and chewed, or it may take the form of deliberate and intentional vomiting after taking, under persuasion, some unrelished article of diet.

Recurrent attacks of vomiting at fairly regular intervals, especially if accompanied by lethargy, fever, rapid pulse and deep respiration, will excite suspicion of acetonæmia, commonly called acidosis, and the urine will be examined for acetone bodies (*see* Chapter XIII).

Whooping-cough.—Vomiting after paroxysmal coughing, with no disturbance of the appetite, is an exceedingly common manifestation in whooping-cough; indeed, the diagnosis is more often made in the early stages on this combination of symptoms than on the inspiratory crow or whoop, which may not develop for some weeks if at all (*see* Chapter XXV).

STOOLS.

The stools of infancy and childhood are an index as to the state of the digestive functions. During the first two days the stools are blackish in colour, but after this, if the child is breast fed, become pale yellow and soft in consistency. The stool of the infant fed on cow's milk is more pale, putty-like in consistence and colour. In health, the stools are passed from two to four times a day.

Normal stools.—The normal stools are passed quietly into the napkin or when the baby is "held out", in contrast to the stools of digestive disturbance which are passed with evidences of pain, violent effort and the expulsion of gas.

Green stools.—Acute diarrhœa, if to any degree severe, is likely to result in the passage of green stools. The typical green stool consists of whitish pieces often mistaken for curds, but in truth soaps derived from the fat content of the food, and green fluid which stains the napkins. Such stools are highly acid and evidence of this acidity will be found in the reddening or excoriation of the child's buttocks. This type of stool is to be found in any form of digestive disturbance of sufficient intensity to cause rapid passage of the food through the bowel. No attack of green diarrhœa should be treated lightly and medical assistance should at once be sought. From the appearance of the stool alone, an exact diagnosis cannot be made. If dyspeptic in origin, the nature of the dyspepsia will be arrived at by enquiry into errors of diet and the subsequent behaviour of the child after suitable dieting.

The assumption is often made that a case of green diarrhœa is of infective origin on the grounds that it started suddenly with high fever; this is an unjustifiable deduction, as the manifestations of non-infective indigestion are also commonly of sudden origin, though the cause may have been at work for some time and minor evidences have passed unnoticed.

The distinction between infective enteritis and non-infective diarrhœa is not always easy; both may be of sudden origin, in both forms there is fever, but in infective enteritis there is more evidence of the toxic nature of the disease, the prostration is greater, there is often blood in the stools, while the fever, which, in non-infective diarrhœa reacts as a rule rapidly to starvation, remains unaffected or even rises.

In cases of green diarrhœa manifesting severe toxic symptoms, the possibility of *parenteral infections,* that is, disease elsewhere, such as suppuration of the middle ear, influenza or pyelitis, must not be forgotten.

Stools which turn green on standing are of no importance.

In lesser disturbances, the presence in the stool of an excess of one constituent of the diet may lead to the deduction that this item is being given in too large a quantity or that the digestion of the child is not competent to deal with it in the amount given. Commonly in this country are seen the stools indicative of *excess of fat* in the diet, whether absolute or relative to the digestive capacity of the child. Such stools may appear in one of two forms, the first, fatty diarrhœa, the stools are loose yellow and acid and appear greasy. In the second, more attempt has been made to digest the fats and they are seen in the form of soaps, the stools being bulky, pale and soft.

The stools indicative of proteid indigestion are brownish in colour and sometimes exhibit the tough yellowish proteid curds. The odour of putrefaction is present.

The stool pointing to excess of carbohydrate in the diet is copious, frothy and light in colour.

Not infrequently diarrhœa arises as the result of starvation. In such a condition the stools are frequent, small in amount, watery and completely free from indigested particles. It is clearly important that the cause should be realised and the child not subjected to further starvation. The complete absence of pain, fever and indigested particles, together with an enquiry into the diet, should reveal the true state of affairs.

Mucous slime is present in almost all abnormal stools; the secretion of mucus is the first reaction of the membrane lining the lower bowel. It will be seen in almost every case of diarrhœa, in constipation, when the hard fæces have irritated the delicate lining and in response to violent purgation. When, however, the mucus is blood-stained, the matter is of more serious import, especially if the passage of blood-stained mucus is unaccompanied by that of fæces. Such mucus, passed by a previously healthv child, with evidence of severe colic and in the absence of fever, will excite suspicion as to the development of an intussusception and urgent surgical advice will be sought. In dysentery, blood, mucus and a mixture of both are passed at distressingly frequent intervals, with evident signs of pain and straining. In severe cases, the motions appear to contain large quantities of pus.

Streaks or flakes of blood on, but not mixed with the motion, are usually due to some slight local cause in the neighbourhood of the anus; it may be slight fissure or ulceration. Such slight bleeding may even be caused by the passage of an abnormally hard motion and need cause no anxiety.

For all cases the stools should be examined for threadworms and when possible microscopically for the eggs of other worms as infection of this nature is exceedingly common.

URINE.

The normal amount of urine in childhood is, according to Professor Still, as follows :—

1st year, 12 ounces per day, 2nd year, 10 ounces per day. After four years, the average figure is reached by multiplying the age of the child in years by 2½, the daily amount, however, being subject to extreme variations.

In the hot weather, the amount will naturally be reduced, though the extra amount of fluid taken should keep the figures somewhere near the above.

The urine of the new-born is copious and clear, though, after the first three days, there may appear a brick-red deposit of urates which stains the napkin but has no significance.

In fever and diarrhœa the urine becomes scanty. In the latter, the amount must be carefully noted as *serious diminution indicates a depletion of the fluid reserve of the body,* which must be restored as rapidly as possible by the administration of water by the mouth, normal saline by the rectum, and, in extreme cases, by hypodermic transfusion. At the same time, not infrequently, if the abdomen of a child who has failed to pass water for some hours be examined, the distended bladder may be felt, the child being unwilling to make the necessary effort for its emptying.

In all forms of sickness it is desirable that a specimen of urine be collected and, after inspection in a clear glass vessel for the presence of any abnormal sediment, pus or blood, it will be examined chemically for the presence of albumin, sugar and acetone. The urine is not only an index of the condition of the kidney, but will furnish information of the presence of more general disease; thus, blood in the urine, almost invariably present in all cases of acute inflammation of the kidney, is also a valuable diagnostic point in scurvy.

Acetone is present in many cases of acute infectious disease, and in all prolonged illness when there has of necessity been some degree of starvation. When found in any quantity, and especially if in association with diacetic acid, it is an indication for special treatment (*see* Chapter XIII).

CHAPTER XI.

DISORDERS OF DIGESTION.

PRELUDE.

Few infants pass the whole of their infancy without some mild attack of abdominal pain of a transient character. This pain is known as *colic* and is caused by spasm of the intestine or the accumulation of wind. The cause is usually a mild indigestion due to errors or excess of food, hasty feeding or in the case of breast-fed infants, some indiscretion on the part of the mother, which has rendered the milk indigestible. Simple colic is of short duration and easily amenable to treatment. No purgative, such as castor oil, should be given while there is pain. Should severe pain persist for more than an hour in spite of appropriate treatment, professional advice should be sought as we may be dealing with appendicitis or other grave disease (*see* Chapter XII).

Treatment.—Gentle massage of the abdomen followed by hot applications—a carminative mixture such as the following :— Sodium bicarbonate two grains, aromatic spirit of ammonia two minims, spirits of chloroform one minim, peppermint water to one drachm. One drachm two-hourly.

When there is much wind and the abdomen is full, a number 8 catheter, well-vaselined, may be passed for an inch up the rectum and left in position for half an hour or so.

When the urgent symptoms have subsided we consider the cause—if there is constipation we give a rectal washout (*see* administration of remedies) followed by one teaspoonful of castor oil for a child of one year. If there are evidences and signs such as vomiting or undigested particles in the stools we cut down the diet and adjust according to Chapter V. In the case of breast-fed infants the administration of water before the feeds may improve the digestion (*see* Chapter IV).

During infancy and childhood the digestive tract is not attuned to the strain constantly thrown upon it by injudicious feeding and other hygienic faults, so that we commonly find in the occurrence of digestive disturbances, evidence that our management is not all that it should be.

The commonest disorders are :—(1) *constipation,* (2) *diarrhœa,* (3) *dyspepsia* (infantile intestinal dyspepsia).

CONSTIPATION.

Constipation is particularly prevalent in India and is in all probability to some extent to be traced to the poor mineral content of the food, together with the want of an invigorating quality in the climate, excessive loss of fluid through the skin, lack of roughage, lack of fat, general inertia and lack of vitamins. The symptoms associated with chronic constipation are many; they are :—

Appearance—complexion sallow, dark rings under the eyes, a brownish staining of the skin folds particularly in the arm-pits and groin. Abdomen prominent. Breath apt to be foul, tongue coated.

Nervous system—irritability, restlessness, sleeplessness or marked restlessness during sleep with tendency to night starts.

Other symptoms—irregular temperature at times, lack of energy, occasional attacks of colic or vomiting, capricious appetite. Not infrequently a few drops of blood may be passed at the end of a hard stool, owing to the rupture of a small vein. Such an accident need not cause alarm.

Regularity in the daily passage of stools may be misleading. There may be an incomplete clearance of the bowel, some is passed while the remainder accumulates in the bowel, a process known as hoarding. When this is suspected a bowel wash may be given and the result may reveal that a large quantity of fæces has accumulated within the bowel. Further, stools may be passed regularly but still be delayed, the stool passed should have passed twenty-four hours earlier. This may be suspected when the stools are hard, dark and streaks of brownish mucus are attached to them. The general condition of the child will also rouse this suspicion.

In infants at the breast, constipation is common, especially during the first two months of life. The child is otherwise in good health; but the motions are infrequent and hard. It is at this time important to take steps to correct this condition, lest habit be established. The mother by correcting her diet, eating more fruit and vegetables and taking plenty of water, may bring about a natural cure, but it is useless for her to take laxatives with the vague idea that these may affect the child. The amount of food taken by the child must be checked by the test meal (*see* Chapter V) as the constipation may be due to insufficient food or even lack of water. One teaspoonful of milk of magnesia

added to the bottle is an excellent corrective and in addition a teaspoonful of liquid paraffin may be given daily.

In all cases of obstinate constipation dating from birth, and particularly in those cases where there is much straining at stool, examination should be made of the anus to exclude one condition, spasm of the sphincter, which is not an uncommon cause of early constipation, and which, if uncorrected, will lead to considerable trouble later. The little finger well covered with vaseline is gently introduced. Where there is spasm, considerable resistance will be felt, which must not be overcome by undue force but by gentle pressure maintained until the resistance is felt to give way. This process is repeated daily for a week. Some cases of this nature are of an extreme type, the abdomen becomes distended, the child blue from pressure of the distended bowel on the lungs, and he is constantly screaming, particularly after the meals, when the pressure within the abdomen is further raised. Relief may be given immediately by the simple manœuvre described above, followed by a small olive-oil enema.

In dealing with constipation in bottle-fed babies, the first step will be to revise the food, to ensure that the quantity is sufficient, the amount of fluid is sufficient and that the constituents are in correct proportion. The fault is likely to lie in high proteid with low fat and carbohydrate. We may therefore dilute our milk and add a little extra fat in the form of top-milk (*see* Appendix), artificial cream, or a teaspoonful of cod-liver oil to two or three bottles and increase carbohydrate in the form of milk sugar or Mellin's food (*see* Chapter V). Failing this we may employ milk of magnesia. The prolonged use of suppositories or enemata is not to be encouraged.

After the age of six months, constipation may be more obstinate and stronger laxatives may be required. In such cases we must carefully examine the abdomen for signs of any marked dilatation of the colon, as in the event of such signs being present, treatment by laxatives and dieting must be supplemented by massage and oil or saline enemata. In simple cases, as a laxative, we may use five drops of liquid extract of cascara combined with 30 drops of syrup of figs, to which may be added one drop of tincture of podophyllin if the stools are putty-like.

For older children it must be distinctly understood that the only merit in laxatives or purgatives is that they are given with the one idea of setting up a regular habit; if need be, they may be continued for a month, until the tone of the bowel is restored and a habit established. A child should be taught to go to the closet regularly at a fixed time daily and this routine, if persisted

in, will be of life-long benefit. There are many useful laxatives for this purpose; as for example—

Ext. cascara aromat. ♏ x
Ext. glycerrhiza liq. ♏ x
Syr. ficorum to one drachm.

Dose one to two teaspoonfuls at night.

The writer has found the following prescription effective:—

Extract cascara aromat. ♏ 15
Syrup of figs ♏ 45
Paraffin liq. dr. 1
Decoct. chandri crispi ad. 3 dr.

Two to four teaspoonfuls according to age.

A useful home remedy for constipation is the following recipe :—

Take 1 lb. of French plums.
1 lb. of Demerara sugar.
1½ ounces of pounded senna and ½ ounce of ground ginger.

Stew the plums in a little water until tender, remove the stones and then add the rest, mix and beat into a paste. One teaspoonful at night for a child of four.

The subject of constipation has been discussed at length partly because of its importance later to the child's welfare and partly because of its frequency in this country but, before concluding, it is necessary to remind the parent that laxatives are but a small portion of the treatment. A regular habit must be aided by a regular and proper diet. In the tropics, fluid readily leaves the body by the sweat glands. The child therefore should drink copiously and if possible between meals; the diet should be simple with the avoidance of seasoned or hot dishes, pastry and sweets should be allowed only in moderation and fruit and vegetables should be taken freely. Oranges and papaya are usually readily procurable at any time and may be given.

In our experience, those cases which are sufficiently severe to be brought to a doctor are never cured by a so-called "suitable diet" alone; there is always some fault, either in the intestinal musculature, or the secretory function of the bowels, which needs correction. Indeed, some of these cases complicated by wasting and lack of appetite abundantly prove the recent researches of McCarrison on the importance of the endocrine glands; for, we have seen cases persisting despite drug, diet and massage treatment, which have rapidly been cured by giving small doses of thyroid extract.

In this country, a not uncommon type of constipation met with is that following dysentery. We think these cases are best treated by the lubricant, liquid paraffin in teaspoonful doses, and if this fails, 5 to 10 drops of the cascara evacuant prepared by Parke, Davis & Co. may be added to the paraffin.

ACUTE DIARRHŒA.

In all forms of ill-health in childhood, whether primarily in connection with the digestive tract or not, the earliest reaction is apt to be diarrhœa. The disorder shows the widest variations in gravity, from the simple acute attack due to overfeeding or chill, to the most severe forms which endanger life. All cases, however, must be treated promptly and the cause sought.

The main causes are as follows :—(1) Errors of diet, whether habitual or single. (2) Climatic conditions. (3) Contamination or infection of food. (4) Dysentery. (5) Incidental to acute illness.

Classification.

1. Simple. Dietetic or climatic. Failure to regulate the diet according to climatic conditions is responsible for most cases. In some cases all the elements of diet may be in excess but more commonly the fat or carbohydrate is in excess, or there may be irregularity in feeding with sweets or biscuits between meals. The onset of digestive derangement in children is characteristically sudden. This is often misleading as the mother will attribute it to some immediate cause, such as a feed of soured milk, whereas careful scrutiny will reveal the fact that the child has not been well for some time, that is to say, the digestion has been failing gradually and that the onset of the diarrhœa possibly with vomiting is merely the culmination.

2. Catarrhal diarrhœa, by which we mean that there is an actual superficial inflammation of some part or the whole of the alimentary tract, may be secondary to the simple form but is more commonly produced by bacterial contamination of the food. This group tends to be severe and resistant to treatment and includes such conditions as summer diarrhœa (acute diarrhœa and vomiting of infants), and the acute fulminating form of white diarrhœa known as cholera infantum.

3. Infective diarrhœa caused by the infection of the bowel with certain specific organisms.

4. Dysentery.

5. Parenteral diarrhœa, that is, the diarrhœa which sometimes accompanies generalised diseases or acute disease outside

the alimentary tract, e.g., at the onset of measles, during pneumonia or with acute disease of the ear.

SIMPLE OR DYSPEPTIC DIARRHŒA.

This form does not as a rule present very serious symptoms. The child has no appetite, the stools are frequent, green and sometimes frothy with excess of liquid and are apt to be passed explosively. Sometimes there is vomiting and often there is fever, though not of a high degree. When the fat has been much in excess the stools will be very pale and greasy looking (*see* Chapter V). With excess of starch, the abdomen is distended, the stools are frothy and there is much passage of wind. Diarrhœa due to proteid indigestion is less common; here the stool is greenish or brown surrounding tough yellowish lumps of curd. The stools of the first two varieties tend to be acid and this acidity combined with the frequency leads to a reddening and soreness round the anus.

CATARRHAL OR INFECTIVE DIARRHŒA.

In the more severe types with persistent vomiting, the stools are excessively frequent and brownish at first. Very soon the stools contain little solid matter and consist mainly of a greenish fluid with abundant mucus and often with streaks of blood. The child suffers from pain and there is crying and straining before and after the stool. In addition, the constitutional symptoms grow rapidly more severe and are attributable to two causes, the toxæmia of bacterial contamination and dehydration, that is, the excessive drainage of fluid from the tissues. The child appears shrunken, the face is pinched, the eyes sunken and a greyish coloration appears round the mouth. In young infants the fontanelle may be felt to be depressed. The hands and feet become cold and bluish. There is marked restlessness and lack of sleep from constant pain or discomfort and the cry becomes enfeebled to a mere moaning. At the inception the temperature will be high, even as much as 105-106°F. but as collapse sets in the temperature drops and may become dangerously low. Sometimes the surface temperature is subnormal while the temperature taken in the rectum is high. Nervous symptoms are prominent :—Twitchings, convulsions, loss of consciousness and retraction of the head. One peculiar and serious sign is seen in the later stages, that is the eyes become markedly congested with profuse lachrymation. The urine is diminished or may be entirely suppressed.

In the most severe type, known as cholera infantum, the stools are white resembling rice-water and constantly drain

away. Vomiting is severe and the progress of the disease is appalling in its rapidity.

TREATMENT.

Mild cases—simple diarrhœa.

All food is stopped for twelve hours or more, but water is given freely, if necessary sweetened with a little saccharin. The first feeds are of whey or albumin water in amounts half the size of the usual feed according to age and given somewhat frequently, say at intervals of 2½ hours. A mild laxative is indicated if there is much undigested matter in the stools, castor oil is safe but apt to cause vomiting, so that a mixture of sodium sulphate grs. 10, sodium citrate grs. 5, syrupi minims 10, water to 2 drachms, is preferable and may be given two-hourly to three or four doses according to the response. If there is much watery purgation, 'Collosal' kaolin grs. 10 may be added to each dose. If there is much mucus or frequent small stools containing undigested matter disturbing the child, a bowel wash of normal saline (*see* Chapter XXXIII, administration of remedies) may be given.

In all cases of diarrhœa, the stools should be carefully examined for traces of yellowish pus, which is an indication of infection of the dysenteric type.

Later, additions to the feed should be made with caution; skimmed milk replaces the whey by degrees and Mellin's food is added. The normal diet is reached by stages according to the tolerance of the child. When the attacks have been severe and the digestive capacity accordingly impaired, the early milk feeds may with advantage be acidified (*see* Chapter V). Before the child is permitted to return to full diet, the original diet must be scrutinised for errors.

In treating the more severe forms the greatest promptitude is required. There must be no delay as the secret of success lies in limiting the gravity of the disease.

The essential indications, in the order in which they demand attention, are :—

1. To replace early the lost fluid and so prevent a serious degree of dehydration.

2. To control the vomiting so that fluid may be taken by mouth.

3. To get rid of the poison within the bowel (bacteria, toxins or poisonous food products) and to counteract the toxæmia.

4. To ensure rest and prevent convulsions.

5. Stimulation.

Water may be given by the mouth in a bottle practically continuously if the child will suck, otherwise in a teaspoon. Where there is vomiting, if water will not be retained then we must have recourse to other methods. It is useless to give rectal saline as it is constantly rejected. It therefore remains to give fluid (normal saline) under the skin, four ounces being injected slowly by gravity method every six hours or, when skilled assistance is available, by the intravenous route.

Vomiting may be treated by washing out the stomach with two grains to the ounce of sodium bicarbonate. When the fluid returns clear a further small quantity is run in and left there. The process is exceedingly simple and is described in detail in Chapter XIII. If the child will swallow, the same effect is attained by giving sodium bicarbonate drinks which will be vomited and so wash out the stomach. Other measures are as follows :—

(*a*) Fractional doses of calomel grain 1/12th with milk sugar every half hour up to a total of three powders, or

(*b*) Atropine sulph. injection grain 1/1000th to 1/500th according to the age of the child; repeated four-hourly, or

(*c*) Mustard plaster, of appropriate strength, to epigastrium.

A saline mixture as follows :—Sodium citrate grs. 5; sodium sulphate grs. 10; glycerine minims 15; water to 2 drachms. Starting every hour and diminishing as the case progresses. A certain judgment should be used in administering salines and if the purgation has already been excessive, it is wiser to add small doses of kaolin grs. 10 or bismuth carbonate grs. 5 to the mixture to moderate the flow, but not to stop it entirely and thereby lock up the toxins in the bowel.

To ensure rest. The child is constantly disturbed by pain, discomfort and the passage of motions. This will result in exhaustion to the nervous system and a tendency to convulsions. Accordingly, as soon as the most acute symptoms have passed, it is advisable to give a sedative mixture as follows :—Phenazone gr. ½ pot. bromide gr. 1, syrupi minims 15, Aq. carui to dr. 1. Repeat in two hours if necessary, otherwise give four-hourly.

Stimulants may be necessary, the best being brandy (*see* under collapse), five drops in a teaspoonful of water every three hours. In case of urgency we may inject adrenalin minim 1 to 3 according to age and repeat four-hourly.

As soon as the acute stage is over, we must consider the question of feeding. There has been a great loss of protein, carbohydrate and mineral salts, all of which we must replace at

the earliest possible moment, bearing in mind the digestive tolerance. For protein we begin with whey and for carbohydrate one of the best foods is raisin tea, made by adding one table-spoonful of chopped raisins (*kismis*) to a pint of boiling water, cooling and straining. This may be given one ounce every hour. The feeds should at first be kept small, one to two ounces and given every hour or two hours. Calcium lactate grs. 2 may be added to three feeds daily.

Further advances are made with extreme caution. The whey is gradually replaced by skimmed milk, or as an additional precaution we may peptonise the skimmed milk. A little later we may add Mellin's food and gradually reduce the time of peptonising the milk. In early convalescence acidified milk (*see* Chapter V) will be found suitable. The return to the normal diet must be gradual.

Drugs, beyond those mentioned above, have no place in the treatment of this condition, and particularly must caution be used in regard to the use of astringents. If used at the wrong moment, they will cause distension and fever, due to the accumulation of intestinal intoxication products. They must be used only under doctor's orders.

There are certain other complications which require attention.

1. Hyperpyrexia (temperature over 104°F.).—Icebag near the head and tepid sponging.

2. Collapse, with coldness of hands and feet and sub-normal temperature :—

Hot mustard bath or, better, electric radiant heat, hot water bottles, brandy by the mouth 5 drops two-hourly in one tea-spoonful of water, if the child does not swallow rub the gums with undiluted brandy. Administer adrenalin minims 2 four-hourly hypodermically or tincture of ephedra five to ten minims six-hourly and finally subcutaneous saline.

3. Irritation round the anus and in the rectum :—

The external irritation of the skin round the anus may be prevented by washing with a dilute solution of sodium bicarbonate, a teaspoonful to a pint of water, and smearing the parts with vaseline or by an application of zinc oxide grs. 20 to castor oil one ounce. This application is renewed every time the bowels are opened.

For internal irritation, the washing out of the bowel in the early stages has its uses, especially if there is an accumulation of undigested food in the rectum or few motions with much straining, but in the advanced stages of the more acute type it

is of little value and even harmful as the mucus which is formed acts to some extent as a protection.

Convulsions will be treated on the lines laid down in Chapter XIV. Threatened convulsions, that is to say, twitching or clenching of the hands and rolling of the eyeballs may often be averted by the timely administration of brandy, or the bromide mixture.

Perhaps we have not done sufficient justice to that old sheet-anchor of mothers and practitioners—castor oil emulsion. It is not that we do not at times employ it, but because we wish you to realise that this fulminant disease requires and reacts better to the saline and alkaline treatment referred to. Castor oil emulsion, that is not more than 5 minims of the oil to the drachm of mixture, is, however, useful in mild cases.

Opium must never be given at the onset of diarrhœa as it will prevent the evacuation of the irritating material. It may sometimes be used during convalescence when the bowel is in a state of hyperactivity, and the food is hurried on without digestion. In such cases a mixture as follows is advised :—Bismuth carb., grs. 5; tinct. camph. co., minims 2; tinct. belladonna, minim ½; gummi acacia q. s., aq. carui ad one drachm, three times a day (suitable for a child of one year old).

Convalescence.

After an attack of severe diarrhœa of any form, the child's general health is much reduced and steps must be taken forthwith to restore it. The digestion is impaired and feeding must be guarded with the greatest caution. There is a particular tendency to obstinate constipation which must be met by suitable aperients, cream of magnesia and liquid paraffin being the best, and by general tonics. There is also often serious anæmia which in more grave cases may be adequately dealt with by the use of liver extract. Iron should also be given in an easily digestible form such as the following prescription :—

Syrup ferri iodide, minims 20, extract of malt, 2 teaspoonfuls (twice a day after food).

This, however, must not be given so long as there is any diarrhœa or until the constipation has been corrected. An excellent remedy is a soup made of liver and spinach, given three times a week. Fresh fruit is introduced early and the fat-soluble vitamins are replaced by giving Radiostoleum or Adexolin as soon as the digestion will tolerate it. When possible a change of air to the seaside or the hills according to season should be given.

Table showing the distinction between the acute forms of diarrhœa.

I. SIMPLE.	II. CATARRHAL.	III. INFECTIVE.	IV. DYSENTERY.
Cause— Errors of diet. Excess of food. Climate.	Arising from simple or "summer" diarrhœa, from "turned" or contaminated milk.	Contaminated food. Specific infection.	Specific infection.
Onset— Usually preceded by signs of lack of appetite.	Sudden.	Sudden	Sudden.
Main symptoms— Vomiting early but not persistent, stools frequent, character according to error in feeding. *Excess of fat.* Early—greasy. Later—whitish. Greenish, watery with white flecks of fat and mucus, acid in reaction.	All degrees of severity. Vomiting may be severe and persistent. Stools green, mucus abundant. Blood in severe cases. Constitutional symptoms more marked. Fever constant, sometimes high. Tongue dry and dehydration rapid. Stools 2 to 20 in number.	Acute diarrhœa and vomiting with early collapse. Fever often high, falling as collapse sets in. Nervous symptoms marked, convulsions or coma. Tongue dry. Dehydration rapid. Stools 2 to 20 in number.	Stools contain no fæcal matter, much mucus, stained red or pure blood. Characteristic spots of yellowish pus. Odour sour and fishy. Griping severe. Stools 10 to 80 in number.

Excess of starchy food.			
Stools—frothy, greyish, much flatus, distension of abdomen, later green stools, acid.	Resistant to treatment. Cholera infantum: a very severe form with intractable vomiting, white stools, early collapse, subnormal temperature.	Response to treatment not very satisfactory.	Early collapse. Fever usual, rapid wasting and dehydration. Exhaustion from sleeplessness. Lung complications common.
Excess of protein.			
Stools—greenish with tough lumps, yellowish-white, alkaline.			
In general, mucus not excessive, no blood, 2 to 20 in number, fever slight, respond easily to starvation.			

Group III tends to merge into group IV. In group III the preponderating appearance of the stools is greenish with much mucus and sometimes blood, but close examination will reveal spots of pus, which may become predominant (*see* the paradysenteric group).

Chief organisms of the infective and paradysenteric groups:—Streptococcus, Proteus vulgaris, B. pyocyaneus, Carolinus group, Salmonella, Morgan No. 1, B. alkaligenes fæcalis.

CHRONIC DIARRHŒA.

Chronic diarrhœa is a disease which may start in a number of ways. It may follow an acute attack, as the result of ill adjustment of the diet, it may be due to the persistence of an infection, usually of the dysentery group, to the presence of worms, it may be due to a persistent error in the diet or to intolerance on the part of the child to some article of diet even though given in what to other children would be a correct amount. Further, the diarrhœa may be part of some constitutional disease such as rickets. The disease may start early in life and is more common in artificially-fed infants.

The diarrhœa is not necessarily constant, periods of quiescence, even with constipation, occur. The importance of the condition lies in its effect on the general nutrition of the child. He becomes pale and languid, there is wasting and anæmia, there is also naturally a decreased resistance to other disease, so that the child easily falls a victim to any infectious disease.

Treatment is in the first place dietetic according to the nature of the stools. At the outset the stools should be examined for evidence of worms or of chronic dysenteric infection, either amœbic or bacillary.

When due to carbohydrate indigestion (*see* chronic intestinal dyspepsia) the abdomen is distended, the stools pale coloured and frothy. When due to fat indigestion, the stools are greasy and white and bulky with intervals during which hard white stools are passed. The condition may be due to faulty digestion of all food factors. We should as far as possible identify the offending factor, as during the stage of building up, this factor must be added to the diet with the greatest caution.

Treatment is undertaken in two stages; the first is the stage of rest to the bowel and recovery, and the second, the stage of restoring the impaired nutrition. It is clearly useless to attempt the second stage till the first stage is completed and the digestive functions have to some extent been re-established. Relapse often occurs owing to premature attempts to increase the patient's weight or to the administration of tonics such as cod-liver oil, before the digestion can tolerate them.

During the first stage the child is kept quiet, free from excitement and with prolonged resting hours. The diet is mainly of whey or peptonised skimmed milk, to which Mellin's food may be given if there is no distension. Clear soup may be given to lend variety and stimulate the appetite, but it has very little food value.

Medicinal :—Start with a mild saline aperient if there is much undigested food in the stools—follow by a powder as follows—Pulv. hydrarg c. cret. gr. ¼; pulv. rhei co. gr. 1½, to a child of a year old, given twice daily for three days. After this a mixture as follows :—Mag. carb. gr. 2; tinct. nucis vom. minim 1; infus. rhei minims 20; infus. gentianæ co. ad dr. 1 is given three times a day before food. In some cases, owing to persistent overaction of the muscle of the bowel, the diarrhœa will not quiet down in spite of adequate dietetic treatment. In one type, known as lienteric diarrhœa, the introduction of food into the stomach induces an outburst of activity throughout the intestine so that each meal is followed by an urgent stool. In such cases sedatives to the bowel are required and the mixture recommended for the same condition after acute diarrhœa may be given.

During the second stage or stage of building up, gradual additions to the diet are made, the effect being carefully watched. The chief signs of improvement are the return of the appetite and the improvement in the colour and consistency of the stools. Constipation may even develop through paucity of roughage in the food and this is a sign for increase.

The first addition is of carbohydrates—preferably in the form of Mellin's food—later unmalted cereals, such as Robinson's patent barley, well-boiled rice or some breakfast food may be added. If there is persistent evidence of carbohydrate indigestion in a tendency to distension, Takadiastase, one tablet, may be given with each meal. Easily fermentable articles such as potatoes, sweet biscuits and pastry are avoided. Fats, either in the form of full cream milk, butter or articles fried in fat, are added with great caution particularly in the hot weather, when the fat tolerance is at its lowest. Articles which are liable to irritate the intestine mechanically, such as pips and seeds, are rigidly avoided.

Other measures, the provision for adequate rest, fresh air, sunshine, and the prevention of chill, are taken. Finally, once the digestion is functioning, iron tonics and vitamins, as in the convalescent stage of acute diarrhœa, are prescribed (for details of diet *see* chronic intestinal dyspepsia).

One form of chronic diarrhœa, happily very rare in this country, must be mentioned. This is *cœliac disease* which is characterised by wasting to an extreme degree of emaciation, stunted growth, a markedly distended abdomen and the passage of large white stools, over prolonged periods. The treatment of this condition is in its essentials, the exclusion of all varieties of food except proteid, until the stools regain their normal colour.

DYSENTERY.

Dysentery is a common disease in India and affects children with frequency and severity. There are two main types, bacillary and amœbic. The former is by far the most common as an active dysentery. Though amœbic infection is exceedingly common, it rarely takes the form of a typical dysentery in childhood (*see* below).

Bacillary dysentery may again be divided into two groups, the dysenteries proper, due to infection of the bacillus of Shiga or Flexner, and the paradysenteries, due to infection with other organisms (*see* table). The distinction between the infective forms of diarrhœa and the paradysenteric group is artificial as the same organisms cause acute infective diarrhœa with green stools and severe toxæmia or alternatively diarrhœa of the dysenteric type with pus in the stools. The microscopic examination of almost all stools of the infective type will reveal pus cells, though pus may not be apparent to the naked eye. It is characteristic of all forms of bacillary dysentery that the digestive functions are suspended from the outset, so that, for the first few hours, the case may suggest acute dyspeptic diarrhœa. It is quite possible that these bacteria which we associate with acute diarrhœa and vomiting may become pathogenic in the presence of dyspepsia which will result in a change of their environment.

BACILLARY DYSENTERY.

The infection by the bacillus of Shiga is the most severe one on account of the poisons produced by the organisms which rapidly produce a state of intense toxæmia with high fever. Occasionally the onset is exceedingly abrupt with high fever, vomiting and diarrhœa and early collapse of such severity as to rouse the suspicion that the case is one of cholera and to require early intravenous transfusion of saline solution to counteract the severe and sudden dehydration. The Flexner .type is more common but usually less severe, with less toxæmia and general constitutional disorder.

Symptoms common to both forms.—Onset sudden with pain and griping, frequent loose motions which are at first brown and watery, and later assume a characteristic form: they are small and are passed with straining, contain no fæcal matter, have a fishy odour quite different from that of the normal stool, and are of great frequency, sometimes as many as 80 a day. In the milder cases they consist of mucus tinged pink, but in the more severe cases they consist almost entirely of pus with shreds of membrane. Occasionally pure blood is passed.

General symptoms.—The abdomen is tender to the touch, there is marked restlessness and exhaustion from sleeplessness due to the constant straining at stool, the temperature is as a rule raised and there is a rapid pulse. Owing to the number of stools there is a tendency to dehydration. The appetite is at first lost but later is apt to be ravenous. In the more mild cases the disease runs a course resembling a severe diarrhœa often with green stools and much mucus, and only close inspection of the stool will reveal spots or flakes of pus. Convalescence is slow on account of the severe impairment to digestion and there is a tendency for the persistence of a lack of tone in the bowel and consequent constipation.

Treatment may be divided into five headings :—

(1) Specific treatment.

Antidysenteric serum is divalent, that is to say, effective both against Shiga and Flexner infections. It is advisable, therefore, once we have established the diagnosis of severe dysentery, to wait no longer for laboratory confirmation, but to administer the serum. Dosage 5 to 10 c.c. to a child one year old, repeated after twelve hours, if necessary. The serum must be given within the first forty-eight hours of the disease, otherwise serious harm may ensue. Of recent years bacteriophage has been introduced which has been of the greatest value. There are two brands on the market, that of the Pasteur Institute, Shillong, and that prepared by the Anglo-French Drug Company. In the more severe cases one ampoule should be given every two hours preceded by water containing a small pinch of sodium bicarbonate till five have been given in the twenty-four hours. During the bacteriophage treatment food should as far as possible be withheld, or, at the least, the bacteriophage be given on an empty stomach.

(2) Relief of discomfort and sleeplessness.

While it is undesirable to give astringents which will lock up the toxic materials, we may with advantage control the excessive activity of the bowel with the colic and straining by the administration of belladonna. We may further induce quietness and sleep by giving bromides. Opiates in any form should not be given. Further, so long as the bowels are opened freely we may give small doses of bismuth which will have a soothing effect and form to some degree a protective covering to the ulcerated surfaces.

(3) Drainage.

In order to induce a free watery flow from the bowel, magnesium sulphate in doses of 20 grains to one drachm.

according to the age of the child, dissolved in water, is given two-hourly daily until a free flow is insured.

(4) Prevention of dehydration.

Water must be given freely. As in the majority of cases there is no vomiting, this is a matter of no great difficulty though in the acute fulminating Shiga type it may be necessary to give intravenous saline.

(5) Absolute rest in bed.

The child must be confined to bed. He should not be allowed to sit up for the passage of stools. Stools should be passed into a bed-pan or pad of cotton-wool held in place with a napkin.

Diet.

The patient is best kept on water only for the first twenty-four hours at least. After this the diet will depend upon the type of infection. For the Shiga type, as the organism flourishes best on albuminous media, the feeding should consist entirely of carbohydrate, glucose or Mellin's food made with water. In the Flexner type, on the contrary, carbohydrate should be avoided and the patient fed on whey and later on peptonised skimmed milk. The increase to normal diet must be gradual bearing in mind that the digestion is seriously impaired.

For the paradysenteric group the treatment is much the same, save that the specific treatment is of no avail. In such cases, of recent times, the specific bacteriophage produced by the School of Tropical Medicine has proved of great value.

AMŒBIC DYSENTERY.

The characteristic symptoms of amœbic dysentery as seen in the adult are rarely seen in young children. Occasionally we meet with cases where the stools are definitely of the dysenteric type though different from those of bacillary dysentery. Fæcal matter is present and is of a typical dark reddish-brown colour with which is intimately mixed blood and mucus. The number is usually comparatively small, four or five daily. The abdomen is tender, particularly in the lower part on both sides. There is little or no fever. More usual is a chronic infection of the same organism which leads to obstinate diarrhœa with muddy stools and periodic intervals of obstinate constipation, loss of appetite and weight, vague abdominal pains and progressive anæmia.

Diagnosis in such cases is suggested by the persistent tenderness in the abdomen, sometimes the colon may be felt to be thickened, and is confirmed by the presence of living amœbæ or cysts in the stools. One examination is insufficient to exclude

the disease and it may be necessary to examine as many as six times after the administration of a non-oily aperient. Not infrequently there is high fever in these cases owing to the escape of *B. coli* from the bowel into the circulation.

Treatment.

The patient is put on a soft easily-digested diet of milk, Mellin's food and a clear soup, and the bowels are kept freely open by small doses of saline aperients, preferably magnesium sulphate. Emetine is a specific in such cases, but children are intolerant and suffer from depression or even collapse if the dose is excessive. For a child of one year the dose must not exceed $\frac{1}{15}$th of a grain and at four years should be not more than $\frac{1}{8}$th, and in both instances the dosage should be limited to six injections. Further treatment is carried out with a view to eradicating the infection, a procedure which may be exceedingly difficult. Carbarsone in doses appropriate to age, 0.075 gm. to a child of four, may follow the emetine treatment. Though this drug is an arsenical preparation it has been given with absolute impunity in a large number of cases, the only adverse manifestation being pains in the abdomen if the bowels are allowed to become constipated. The course of carbarsone is limited to ten days and should not be repeated for three months. The average total dose, based on body weight, is about 75 mgm. per kilo. given in 10 days (Chopra).

One other form of parasite of this nature, *Giardia intestinalis*, has been found to produce a chronic diarrhœa with mucus or occasionally a little pus in the stools. The diagnosis is made by the discovery of the living organisms or cysts in the stools. Treatment is by Stovarsol, dose gr. $\frac{1}{2}$ for a child of one year for six days.

CHOLERA.

Cholera is fortunately a rare condition amongst children. Even during times of epidemics the incidence is markedly lower than in adults. Indeed, young children seem to have some degree of immunity to the disease. The symptoms and treatment are identical with those of adult life and the amount of intravenous hypertonic saline injected, is in proportion to the estimated weight of the child (for the protection of older children by inoculation *see* Chapter IX).

INTESTINAL DYSPEPSIA.

(Mucus disease or Eustace Smith's disease.)

Chronic intestinal dyspepsia is one of the commonest causes of ill health among children in India and is entirely due to errors

in the diet, the main error being the preponderance of starchy and sugary food. In European children the general digestive tolerance is lowered in the hot weather at which time the disease usually starts and improvement is immediately seen on transfer to the hills or to Europe. Not infrequently the predisposing cause is one of the infectious diseases of childhood whereby the general vigour is lowered. The disease lies midway between chronic constipation and chronic diarrhœa and partakes of the character of both.

The symptoms noted by the mother are often those of the general nervous system rather than indigestion. Restlessness at night, night terrors, irritability and teeth grinding are common so that, when there is any change in the demeanour of the child or any unusual nervous symptom, our first point of investigation is the digestion.

Other symptoms to be noted are: want of energy, actual loss or failure to gain weight, irregularity of the bowels; sometimes diarrhœa and sometimes constipation; persistent cough due to gastric irritability. It is somewhat misleading that the child does not often complain of pain. The tongue is furred or pale, flabby and glazed, there is sometimes irregular fever and the appetite is capricious. The motions are often slimy, hence the name mucus disease, and may contain much undigested matter or may be frothy and large. As a variety there may be the urgent passage of stools immediately after meals, which is known as lienteric diarrhœa. Associated with this condition we sometimes meet with persistent bed wetting. The general appearance of the child is somewhat characteristic, the complexion is muddy and unhealthy looking, and the face may appear puffy with dark rings under the eyes. He is thin with a marked prominence of the abdomen due to distension. This distension is sometimes so marked that the lower ribs are pushed outwards or the muscles of the abdomen are separated so that when the child in the supine position lifts his head there is a marked bulging down the centre of the abdomen. When there is much constipation the folds of the skin, as in chronic constipation, will be stained. The treatment is mainly dietetic and is based upon the fact that all the functions of the digestive system are impaired, but mainly those of carbohydrate and fat digestion. In many cases the disease is prolonged or accentuated by the administration of tonics, particularly cod-liver oil, before they can be tolerated. During the first stage the diet is limited to skimmed milk with Mellin's food with beef tea or chicken soup and malted rusks such as Allenbury's. With improvement we advance to the second stage and add baked bread, a little honey, fruit juices, boiled fish, minced chicken or

mutton and selected vegetables such as cauliflower or very young mashed carrots. Later, the fish may be grilled instead of boiled and small varieties in the diet are permitted in the addition of such articles as 'Force', Madeira cake, a very little butter and fruit juice. The third stage consists of the gradual return to the ordinary diet appropriate to the age (*see* Chapter V). There are some articles which must be avoided for a considerable amount of time, notably all articles containing pips or seeds or indigestible husks such as pineapple, strawberry jam or coarse oatmeal, and salt meats, bananas, smoked fish and whole milk.

Drug treatment.—Rhubarb and grey powders for three days (*see* section on diarrhœa) followed by the rhubarb mixture. Where there is much persistent carbohydrate indigestion as evidenced by much distension of the abdomen, one Takadiastase tablet may be crushed over each meal. Later a tonic such as the following may be given :—

Syrup ferri iodidi, ½ drachm; extract of malt, 1½ drachms (twice a day after food).

Sunshine and fresh air are essential and where available ultra-violet rays will do much to improve the general tone.

Additional factors :—(*a*) As in all cases of digestive disturbance in children who have developed their teeth, special attention must be paid to their condition and any decay must be rectified, as, frequently digestive disturbances arise owing to lack of mastication of the food and this failure of mastication is due to the tenderness of decayed teeth. Some children are habitual bolters, they do not chew their food at all. This is a matter for education. (*b*) In all cases of this type we must remember the possibility of infection by worms and when possible stool examination should be carried out. (*c*) Give water freely, but allow no food or sweets between meals. (*d*) Allow nothing to eat after 6-30 p.m. except a cup of milk and a rusk. (*e*) If possible allow no water at meals but give freely one hour before or one hour after. (*f*) Do not give too much milk in addition to a substantial dietary.

CHAPTER XII.
PROLAPSE OF THE BOWEL, HERNIA, ABDOMINAL PAIN.

PROLAPSE OF THE RECTUM.

Any condition which causes straining at the passage of stools or of urine may induce a protrusion of the bowel through the anus, which will persist unless reduced. In appearance the protrusion is a red or purplish glistening tumour alarming but not dangerous if immediate measures are taken towards reduction. Should reduction not be carried out, ulceration and strangulation of the protruded segment will follow.

The factors which usually cause this straining are constipation, worms, chronic dysentery or an overlong foreskin with a tight aperture. The effect will be aggravated if the child is debilitated or wasted, as the affected parts then lack the natural elastic support of the fat.

Reduction.—The protrusion is smeared with vaseline, protected with lint or a clean handkerchief and gently squeezed with the fingers to empty it of blood. When somewhat reduced in size it is gently pressed towards the body and will, after a few moments, slip back. The child should be kept lying on its side for some time after and should there be a tendency to straining, or a recurrence, the buttocks should be strapped together with adhesive plaster which should be removed only for the passage of a stool.

The cause, as suggested above, should be sought and removed. In the meantime, the child should not be permitted to sit at stool and should pass the motion in a bed-pan. This may be facilitated by giving a small enema of olive oil or cold normal saline solution (one teaspoonful of salt to a pint of water). Give 6 to 8 ounces according to age. Bearing in mind that the accident happens almost exclusively in debilitated children, steps should be taken to treat the general condition.

HERNIA (RUPTURE).

By rupture is meant a protrusion of some portion of the contents of the abdomen through a gap in the muscles, resulting in a soft swelling under the skin. There are two common sites for rupture :—(1) at the navel—umbilical hernia; (2) in the groin—inguinal hernia.

1. *Umbilical hernia.*—Either at the time of birth or shortly after the separation of the cord, a soft round swelling is seen at the navel. The swelling subsides when the child is on its back, but reappears during crying, sneezing, coughing, straining

or if the abdomen is distended. The swelling may be reduced by gentle pressure and the margins of the aperture felt by the tips of the fingers. There is no pain.

Treatment is usually simple :—A small flat pad, preferably stiffened with a coin the size of a rupee or a pad made of a flat piece of thick gutta-percha covered with two or three folds of linen, should be secured to the centre of an elastic binder, and should be continually worn night and day around the belly: that is all that is required. A convex pad should never be used, because, although it pushes the bowel back more effectually, it at the same time pushes into and enlarges the opening, instead of helping it to close. During treatment all conditions which cause strain, especially constipation or cough, should be carefully treated. After a few weeks the abdominal walls should be fully developed and the aperture is then closed.

Special trusses for this purpose may be obtained from any chemist.

2. *Inguinal hernia.*—Rupture in the groin appears as a swelling on the inner side of the groin, sometimes extending down into the scrotum. The swelling may appear and disappear in the same manner as umbilical hernia. There is usually no danger attending these cases in infancy, though rarely the rupture becomes fixed, tense, tender, and requires immediate surgical aid Nevertheless, if not cured at a very early age by simple mechanical means, the rupture will be a source of disability later on and even of danger. The milder forms may be cured by the application of a simple woollen truss in the manner shown in the diagram on page 126 and the removal of all causes of straining (*see* prolapse of the rectum), but the majority of cases will require operation.

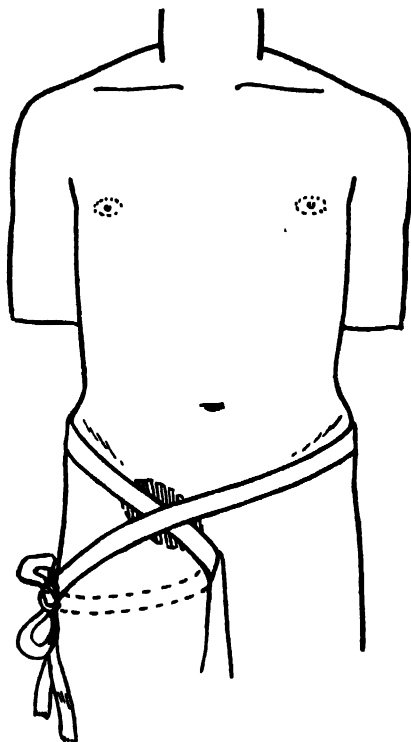
Opinions vary somewhat as to when the operation should be performed, but on the whole it appears that it is best performed at about the age of two, provided the child has gained control of the bladder, so that there will be no risk of the dressings being soiled by urine. The same precaution as regards strain should be taken as for umbilical hernia.

ABDOMINAL PAIN AND THE ACUTE ABDOMEN IN CHILDHOOD.

(*For practitioners.*)

Abdominal pain in a child should never be regarded lightly for though in some cases it may be due to a passing attack of indigestion, in others the cause may be one of great gravity. The investigation of abdominal pain should be made with warm hands, noting carefully the area of tenderness and whether there is wincing on deep pressure. It must be remembered that an

infant or child as a rule is unable to give that exact information as regards location of the pain which is so important in the adult, therefore your diagnosis usually has to be made by the method of exclusion; by this we mean that there are many well-known causes of acute abdominal pain, each of which has to be separately thought of and excluded before a definite



diagnosis can be reached. The practitioner may be able to elicit whether the pain is deep or superficial on pressure, whether there is any guarding of the muscles or whether there is any pain when gently pinching up the skin of the abdomen between the fore-finger and thumb, the viscero-sensory reflex.

Abdominal pain may be due to causes outside the abdomen as well as inside the abdomen.

Extra-abdominal causes.

1. *Basal pneumonia or pleurisy* may give rise to referred pain in the abdomen with some degree of rigidity which may

simulate appendicitis. Many cases have undergone unnecessary operation when a thorough investigation and examination of the lungs would have revealed the true state of affairs.

2. *Spinal caries.*—In the early stages of tuberculosis of the spine, it is not uncommon for the pain to be referred to the front of the abdomen, rather than the back.

3. *Torsion of the undescended testicle*, an extremely rare accident; the sudden appearance or development of a hernia during straining at stool or a tight foreskin may cause symptoms referred to the umbilical area.

Intra-abdominal causes.

1. *Colic and flatulence.*—These are the commonest causes of abdominal pain and are due to indiscretions in the diet, undigested food in the intestine or worms. In other cases, fermentation of food results in acute distension of the intestines with gas, giving rise to attacks of screaming with the legs drawn up. As a rule the attacks are spasmodic and there is no fever; firm pressure with the hand relieves the pain rather than augments it. The treatment of this condition will be found in Chapter XI.

2. *The onset of acute bacillary dysentery.*—Owing to the acute inflammation or ulceration of the colon, there may be severe abdominal pain coming on in gusts of colic, before the mucus and blood, which reveal the true state of affairs, make their appearance. There is fever and the abdomen is resistant to pressure. In a few hours or after giving a warm saline enema, the cause of the symptoms will become manifest.

3. *Chronic intestinal dyspepsia (mucus disease)* is an occasional cause of recurrent abdominal pains. In such cases the presence of worms should be borne in mind. Many of these cases in the initial attack of pain and vomiting with or without collapse resemble appendicitis, but rectal examination is negative, and the pulse and temperature is rarely raised. Moreover, the viscero-sensory reflex is absent. For treatment of these conditions *see* Chapter XI.

4. *Appendicitis.*—Acute appendicitis is fortunately a rare condition in young children. The condition is grave as protective adhesions are slow in forming. The onset is sudden and the cardinal symptoms are :—pain and tenderness with rigidity in the right iliac fossa, vomiting, constipation and tympanites, rapid pulse, fever. . Collapse sets in early, not because perforation has occurred, but from shock. Operation should be performed as soon as the diagnosis is clear.

Chronic appendicitis is also a rare condition in early childhood but is of importance as the condition may be ascribed to cyclical

vomiting, which is not in itself a complete diagnosis. In such cases there is likely to be a history of repeated attacks of abdominal pain and vomiting of sufficient severity to confine the patient to bed. Examination will reveal tenderness and possibly rigidity in the right iliac fossa. Operation should be performed without delay as soon as the diagnosis is sure, but before making such a diagnosis it is important to eliminate intestinal worms and chronic intestinal catarrh as causes of the attacks of pain. A careful dietary as given under Chapter XI may clear up all symptoms. It must be remembered that in some children with a history of right-sided pain, careful palpation may feel a lump or thickening. Such thickening, if not due to old inflammation of the cæcum (amœbiasis) or appendix, may be due to tubercular glands. X-ray examination after a barium meal may be of assistance in establishing a diagnosis.

5. *Intussusception.*—This is not as common a condition as is generally supposed, but when occurring, is a matter of extreme urgency. Intussusception has been observed in the early months of life, but the tendency diminishes as childhood advances. The onset is sudden with acute abdominal pain recurring at frequent intervals and so severe that the child screams. Vomiting is a feature of the opening and late stages. The stools are characteristic, consisting of a small amount of pink mucus and streaks of blood only, passed with great straining. The diagnosis is confirmed by the palpation of a soft elongated tumour in the abdomen which tends to migrate slowly from right to left. The commonest site in the first few hours is below the liver region, later it may be felt above the umbilicus and later still in the left iliac fossa. The tumour is formed by an invagination of the intestine upon itself which gradually progresses onwards so that at a later stage the advancing portion may be felt in the rectum. If diagnosis is not made before this, operation may be too late.

The development of this condition may usually be ascribed to overdoses of violent purgatives or the ingestion of food beyond the digestive capacities of the child. In this country the diagnosis must be made with caution as the onset of an acute bacillary dysentery may offer a close resemblance.

Operation should be performed at the earliest possible moment, though occasionally, in the early stages, the condition is relieved by warm saline enemata and gentle manipulation of the abdomen. Such measures are, however, dangerous, if attempted in the later stages.

6. *Stone or gravel in the urinary tract.*—These conditions are moderately common in the East and occur always in poorly

nourished and ill-fed children. McCarrison has shown that it is a deficiency disease and is due to want of vitamins.

If a stone is in the pelvis of the kidney or enters the ureter, the pain is intense and starting in the loin, may be referred to the front of the abdomen, with vomiting and cold sweats. When occurring on the right side the differentiation from appendicitis is difficult, but the starting point of the pain in the loin and the presence of blood in the urine will afford clues. An X-ray photograph will show the stone in the kidney, ureter, bladder or urethra. The passage of a storm of oxalate crystals down the ureter may produce a condition closely simulating an acute abdomen.

Palliative treatment consists of giving ample bland fluid water or barley water with 20 grains of potassium citrate four-hourly. Morphia with atropine may be necessary during acute colic (dosage according to Chapter XXXIII). For less severe pain a mixture as follows is suitable :—For a child of four, tinct. belladonnæ, minims 2; tinct. hyoscyami, minims 5; tinct. cardamoms co., minims 2; water to half an ounce, four-hourly. A small stone may pass without further assistance, but should a stone be present and not passed despite treatment, surgical intervention will be necessary. Further, the diet must be regulated to prevent intestinal fermentation which is a source of oxaluria, an adequate supply of vitamins must be insured and finally those foods which have a high oxalate content such as the following must be avoided :—tomatoes, spinach, cucumbers, potatoes, beetroot, French beans, strawberries, plums and rhubarb.

7. *Inflammation of the pelvis of the kidney* due to *B. coli* (pyelitis) is not an uncommon cause of subacute pain in the loin or abdomen of children, most often female children. In this condition there are frequently rigors and delirium with a temperature remitting from 104 to 99 degrees. For diagnosis and treatment of this condition, *vide* Chapter XVII.

8. *Enlargement of the liver or spleen* associated with acute hepatitis, infantile cirrhosis or malaria and kala-azar, or leukæmia are conditions which may give rise to abdominal pain and distension.

9. *Tuberculosis in the abdomen* may take the form of peritonitis with or without effusion, tuberculosis of the mesenteric glands (tabes mesenterica) or ulceration of the small intestine. More than one type is frequently present at the same time. There is marked wasting, irregular fever, and diarrhœa. Enlarged glands may be felt, there may be evidence of fluid or, more commonly, the abdomen is tumid with a peculiar doughy

feeling. Treatment consists of careful regulation of the diet to the digestive capacity, using predigested milk if necessary, control of the diarrhœa, administration of cod-liver oil or concentrated vitamins and exposure, both general and local, to ultra-violet rays.

10. *Pneumococcal peritonitis* is a very rare condition in the tropics. As a rule it occurs after an attack of pneumonia or middle-ear disease but it may be a primary infection. The symptoms are those of subacute peritonitis and within a few days the abdomen fills up with thick greenish pus like that of an empyema. The child is seriously ill, and as often as not, there is diarrhœa. Operation is the only cure, although in a few cases the pus may be discharged at the umbilicus or into the bowel or vagina.

11. *Henoch's purpura* in its onset almost exactly resembles intussusception or acute appendicitis. That is acute abdominal pain, vomiting and collapse. In one of our cases, blood was passed with the stool and in another with the urine, but in each case when the whole surface of the body was examined, 12 hours after the attack began, here and there was seen minute hæmorrhages into the skin varying in size from a pin's head to a 4-anna piece, and there was some pain and swelling in the big joints. The abdomen was hollowed and tender, but there was very little fever; in one case, the mother gave a history of a precisely similar attack six months previously. The cause of this curious disease is probably some toxin in the blood originating from the intestinal tract. The condition is a grave one and, if the hæmorrhages be severe, may be rapidly fatal.

Treatment.—The real danger in these cases is that if a precipitate diagnosis of an abdominal catastrophe be made and operation performed, such treatment will invariably be fatal. Hæmorrhage into the skin should be looked for and then the diagnosis differentiated from scurvy or possibly cerebro-spinal meningitis. It should be remembered that purpura associated with abdominal pains in children is Henoch's disease and that the treatment is entirely symptomatic with absolute rest in bed.

12. *Allergic conditions.*—Sometimes in allergic conditions due to food poisoning the first symptoms may be acute abdominal pain with vomiting, purging, tachycardia and collapse. Later the appearance of an urticarial rash may reveal the true nature of the disease.

13. *Rheumatic infection* may simulate acute abdominal inflammation, but there is likely to be a history of recurrent pain in various parts of the body and possibly evidence of carditis (*see* Chapter XXII).

CHAPTER XIII.

VOMITING, CYCLICAL VOMITING AND ACIDOSIS.

VOMITING.

The simpler forms of vomiting are described in Chapter X.

Vomiting in infants and young children is not only the ready response to all forms of digestive disturbance but also to any form of acute disease, and not infrequently accompanies the opening stages of any disease of abrupt onset, such as the acute eruptive fevers.

In infancy, when due to digestive disturbance, it is almost always accompanied by diarrhœa, an important diagnostic point. The common cause is incorrect feeding, either in quantity or quality. When complicating severe diarrhœa it is of grave significance as the tendency to dehydration is increased and the replacement of lost fluid is rendered more difficult.

One special type must be mentioned, the vomiting of *hypertrophic pyloric stenosis*. This is a condition induced by the failure of the lower end of the stomach to open sufficiently to allow the contents to pass on. It usually starts about the tenth day of life and has certain definite characteristics. The vomiting is propulsive in character, that is to say the ejected matter is thrown out with force, there is obstinate constipation, examination of the abdomen may reveal peristalsis (visible waves of contraction passing over from the left to the right side) and finally, in advanced cases, a small tumour may be felt just under the ribs on the left side. Naturally the child wastes, as little food passes beyond the stomach. Early operation is desirable and gives the prospect of good result.

Treatment.—In mild cases all that is necessary is a rest from all food for a few hours and a mild saline purgative (No. 3) or an enema as soon as the vomiting has quieted down. Castor oil is undesirable in such cases as it will increase the tendency to vomit.

In more severe cases further treatment is required :—

1. Give a solution of sodium bicarbonate, a teaspoonful to a small tumbler of water, the amount half the quantity of the normal feed of the age. This will probably be returned but will serve the purpose of washing out the stomach. In infants it is an easy matter to wash out the stomach with a stomach pump and a solution of sodium bicarbonate, grains 10 to one ounce, but older children will resist vigorously.

2. Place a dilute mustard plaster over the stomach for ten minutes.

3. Administer powders as follows :—Calomel grain 1/12th, sodium bicarbonate grains 5, at half-hourly intervals for three doses. This is suitable for older children only.

4. If the vomiting is persistent and the child is rapidly becoming exhausted for want of fluid, administer a hypodermic injection of atropine sulphate grain 1/1,000 to 1/300, according to age.

5. Continue to give cold water by the mouth, in small quantities, even if it is rejected as long as the child takes it willingly.

6. A little dry glucose powder may be given, it is often retained and may neutralise the tendency to acetonæmia (*see* below) which the persistent vomiting may set up.

7. If in spite of all measures the vomiting persists, fluid must be administered through other channels (*see* Chapter XI, acute diarrhœa).

The first attempts at feeding should be cautious, glucose water, dry glucose, Mellin's food made with water or raisin tea, should be given cold, and later whey may be added. The feeds should be small at first, not larger than a quarter of the bulk of the feed taken in health. Water should be given freely in the intervals.

CYCLICAL VOMITING AND ACIDOSIS.

Acidosis, or as it is more correctly termed, acetonæmia, is prevalent in hot countries. The reason is not far to seek. The condition is intimately connected with many forms of dysfunction of the digestive system and especially when the fat content of the diet is higher than climatic conditions warrant. Further a number of cases are dependent on nervous excitement, and in this country of somewhat unnatural surroundings and constant change, the nervous system is liable to be in a condition of strain. In a certain proportion of subjects, the vomiting is severe from the outset and dominates the picture. Such attacks recur at more or less regular intervals and are spoken of as cyclical vomiting. In other subjects the vomiting is less urgent or even absent. In the ensuing sections it will be shown that the causes of the attacks are multiple. In many cases more than one factor is at work, but they may be divided into certain groups :—

Primary. Due to digestive disturbance including disorder of the liver function. There is a general tendency in the tropics, especially amongst Europeans, to adhere to standards of diet laid down for temperate climates. The conviction is growing on the

writer daily that for hot climates the correct ratio of fat to carbohydrate in infant feeding is not 1 to 2 as in temperate climates, but nearer 1 to 4, and that the correct percentage in milk mixtures is fat 1.5–2 to carbohydrate 7–9.

Again, in the case of breast-fed children, the writer has found that the fat percentage is frequently too high and results in early dyspepsia. Thus is the train laid for fat intolerance, which is a condition not only of alimentary dyspepsia, but of an inability to complete fat combustion even in the presence of an adequate carbohydrate ratio. Such a condition once established is persistent, and it is probable that in many of the subjects of recurrent bilious attacks, cyclical vomiting and associated disorders, the seeds of the disease are laid in very early life. That fat intolerance is easily, almost automatically, acquired was impressed on the writer in comparing the digestive capacity for fats of infants born in the hills with those who have spent some months in the plains. The former will accept an almost English scale of diet, while the latter must be introduced to this standard gradually and cautiously.

In older children other factors are at work; abrupt alterations of temperature, chills, etc., lead to disordered action of the liver, whilst in the common condition of carbohydrate dyspepsia, an associated pancreatic deficiency may be presumed.

Quite distinct from the above are the children of the second type, the sugar-shortage children. In these children there is no evidence of dyspepsia apart from vomiting, which is due rather to emotional crises, or is associated with the later stages of an attack of acetonæmia. They are of a well-defined type, usually attractive, active mentally and physically above the average, well formed but thin and slow in putting on weight; they are easily excitable. It is to be supposed that there is excessive adrenal output and clinically there is often a suggestion of adrenal exhaustion. Such children are prone to vomiting in moments of emotion or in the state of exhaustion to which they are liable, and the vomiting may set up the vicious circle of an attack clinically identical with cyclical vomiting. An example may be offered in a girl of 9 who had suffered from periodic attacks with severe vomiting, fever and prostration, from the age of 17 months. Under treatment she remained clear for 18 months, but the distress caused by the loss of a favourite doll broke down the defences and a typical and severe attack ensued. A common type is seen in railway acidosis. The writer has seen a number of children who arrived at the end of each migration to the hills or plains in a state of collapse, with fever, rapid pulse, lethargy and persistent vomiting. These children were enabled to perform

their journey in complete comfort by subsisting on a fat-free diet for two days before and during the journey, the diet consisting mainly of Mellin's food, dry biscuits or toast with honey, glucose or barley sugar, beef tea. No butter or milk.

The family history often reveals a strong asthmatic or migraine inheritance and in later years the patient may grow out of the acidosis habit to become the victim of migraine. Some children develop asthma when, and only when there is an excess of acetone in the system.

Briefly then, there are two main types of primary acetonæmia, the first, independent of the carbohydrate ratio, but due to faulty fat metabolism and associated with disturbances of the liver function and the second due to sugar shortage.

The third type of acetonæmia is secondary and is of importance under three considerations: (*a*) That by its presence the symptoms and discomfort of the primary disease are intensified. (*b*) That, in the presence of a primary cause, acetonæmia may be avoided by adjusting the diet to the requirements of the patient and the disease. (*c*) That many cases of cyclical vomiting are traceable to a definite cause, placing the condition in the category of a secondary acetonæmia; (e.g., girl aged 7, two attacks culminating in deep coma within six months of each other; the child was found to be suffering from a markedly dilated stomach, on treatment of which the attacks did not recur). The main causes of secondary acetonæmia are :—

(*i*) Any acute illness or infection leading to high fever.

(*ii*) Any condition, especially vomiting or persistent diarrhœa, which induces relative or absolute starvation.

(*iii*) Sepsis or local infection, especially of the nose or throat.

The *symptoms* of a major attack will consist of the following :—

1. Fever of varying degree; often as high as 104°F.

2. Rapid pulse rate with lowered tension, particularly marked in those cases due to sugar shortage. (For example, a child of 5½, of the typical sugar-shortage disposition and physique, had an abrupt rise of temperature to 103°F., pulse 180 per minute, counted with difficulty; after repeated doses of glucose the pulse rate was reduced to 120 in six hours and the imminent collapse averted.)

3. The breathing sometimes deep and rapid, sometimes irregular. (e.g., child aged 5, temperature 103°F., pulse rapid, respiration rapid and irregular, general condition suggests the onset of pneumonia; urine loaded with acetone. *Cause*—Drinking two pints or more of rich-cream dairy milk daily during the hot weather).

4. Lethargy is a common symptom especially of the bilious primary type, occasionally amounting to coma. The writer has also seen convulsions associated with a high urine content of acetone.

5. Vomiting is by no means a constant or essential symptom. When present, distinction should be made between vomiting as cause and as effect.

6. Pain in the abdomen. A comparatively frequent feature —but how far such pain is an integral part of primary acetonæmia, or how far such pains associated with vomiting indicate a concealed cause, is a matter for further investigation. Such pain must be carefully investigated as attacks labelled as cyclical vomiting have been found to be due to chronic appendicitis.

7. Smell of sweet almonds in the breath. This is sometimes noticed hours or even days before the attack. When this is so the case must be regarded as one of primary acetone poisoning, but in the majority of cases, the acetone is noticed only when other signs have been evident for some hours.

The attack usually lasts from two to five days, but acetone persists in the urine for some time after the symptoms have subsided.

Such are the symptoms which constitute a grave attack. Minor degrees are of course frequent, and are attributed by the laity often with a sufficient accuracy to "biliousness". There are also minor symptoms of sugar shortage, chief amongst which are a tendency to exaggeration of the pulse rate in excitement or fatigue; early inducement of exhaustion, and pains in the limbs often ascribed to rheumatism.

The treatment of acetonæmia may be considered under two headings, the treatment during the acute attack and the prevention of further attacks.

Treatment of the acute attack.

Sodium bicarbonate solution to drink (*see* above). When there is obstinate constipation a bowel wash should be given and after the wash a few ounces of 5 per cent. glucose in a normal saline solution run in. Glucose should be given by the mouth as soon as possible, preferably in half teaspoonfuls of the dry glucose at frequent intervals washed down with small sips of cold water. After the acute symptoms have subsided a powder as follows may be administered in water three times during the first day to a child of four :—Sod. bicarb. grs. x; pot. cit. grs. v; mag. carb. pond. grs. v; calc. lactate grs. iii.

The diet during and after an attack must be carefully regulated. Until the acute stage has entirely passed the following only should be given :—Sugar and orange juice, glucose, raisin tea, Mellin's food.

Early convalescence—

Breakfast : Strained oatmeal, bread and honey.

Lunch : Chicken soup and potato or vegetable broth, sago shape flavoured with lemon or fruit jelly.

Tea-time : Orange juice and sugar, sponge cake or dry biscuits.

Supper : Oatmeal or barley jelly, Horlick's malted milk.

Later—

Breakfast : Porridge with treacle or brown sugar, cup of skimmed milk, bread.

Middle morning : Cup of Mellin's food made with skimmed milk or water.

Lunch : Fish or meat and vegetables, pudding made with skimmed milk or fruit jelly or stewed fruit.

Tea-time : Toast or bread with honey or treacle, orange juice, or tomato juice.

Supper : Horlick's malted milk or skimmed milk with Mellin's food.

Prevention of further attacks.

The prevalent custom of continuing high doses of sodium bicarbonate between the attacks is to be deprecated; although it will avert the graver symptoms during the attack. it will not dispel the acetone; indeed, the acetone reaction may be obtained in urine of a high sodium bicarbonate content. Large doses act deterrently to the general recovery of tone. The writer prefers to use mixed salts after the first stage, for a few days only acting on the assumption that there is general mineral depletion.

For the sugar-shortage type the addition of large quantities of sugar to the diet and the restriction of fats will be effective.

In the bilious type, calomel is invaluable, and mothers may learn to administer this during the premonitory stage and thus avert attacks. Where there is carbohydrate indigestion, Takadiastase is useful.

It is undesirable and often unnecessary to place children on fixed restricted diets though the following are best omitted or reduced to a minimum. Butter, cream, fried food, foods cooked in oil or ghee, cod-liver oil, Virol and the like, should be cut out

of the diet. Eggs are rarely tolerated and the milk should be skimmed. Full or half cream patent milk should not be allowed, but Horlick's, which is practically fat-free milk, may be given. We have found that a cup full of fresh orange juice or hot water first thing in the morning is beneficial. A stick of raw sugar-cane or barley sugar to chew is equally good, followed by a cup of water. The intervals between the meals should not be prolonged and, if the child goes to school, sustenance, such as a cup of Horlick's malted milk with a stick of barley sugar, should be provided in the middle of the morning. Progress should be checked, particularly when fat is added to the diet, by the frequent testing of the urine for acetone.

Test for acetone or diacetic acid.

The Rothera test is the best and is as follows :—Take one quarter of a test-tube of urine and add an equal quantity of saturated solution of ammonium sulphate, add a little strong ammonia (liq. ammon. fort.) and then add a few crystals of, or a few drops of, a five per cent. solution of sodium nitro-prusside. If acetone or diacetic acid is present, the liquid acquires a rich purple colour, and the length of interval before the colour appears and its intensity afford some indication of the quantity of the acetone present.

The foregoing paragraphs will indicate on what line investigation for first causes should be taken. It will be borne in mind that neither the term cyclical vomiting nor acidosis is a diagnosis but merely a term indicating a group of symptoms attributable to one of the causes enumerated above.

ANÆSTHETICS AND ACIDOSIS.

To the child suffering from acidosis, the administration of anæsthetics is not without danger, but the danger may be averted if careful preparations are made. These consist in feeding the child on an easily digestible carbohydrate diet for two days before the operation and avoiding fat in all forms. Drastic purgatives must be avoided and the child should undergo no prolonged period of starvation before the operation. If other circumstances permit, the child should be given from one half to two ounces of glucose before the operation. All anxiety and fright should be avoided as this may precipitate an attack. The urine should be tested at intervals beforehand and the anæsthetic should not be administered till the urine is free from acetone. As soon as possible after the operation, the child should be given glucose 10 per cent. solution by the rectum by the drop method.

ALKALOSIS.

Attention has been so much drawn to the danger of acidosis induced by persistent vomiting that we are apt to overlook the fact that there is a tendency in some of these cases to swing in the opposite direction and develop a state of alkalosis. The symptoms in such conditions are difficult to distinguish, although the respiration will be shallow instead of being deep. A curious condition sometimes develops known as tetany (*see* page 150). It is therefore not desirable to give unlimited quantities of alkalis to children who are subjects of persistent vomiting and rather should we attempt to neutralise the acetonæmia by the administration of glucose.

CHAPTER XIV.

CONVULSIONS, CROUP AND SPASMOPHILIA.

Convulsions and croup may be provoked in the previously healthy child by diseases of comparatively sudden onset. Such phenomena do not develop equally in all children. Some children are more prone by reason of inherited nervous systems delicately balanced. In others, the nervous and muscular systems become highly sensitive owing to certain disorders and diseases and on slight provocation, explosions of over-activity are manifested in croup, convulsions and tetany. This highly sensitive state is known as spasmophilia and is induced by some alteration in the body chemistry, a deficiency in calcium such as is seen in rickets, an alteration of the acid-base as seen in persistent or prolonged vomiting or by the absorption of poisons from the bowel in case of severe or prolonged diseases of the digestive system.

CONVULSIONS.

The phenomena of an attack.—Sometimes, but not always, there are " warnings " of the approach of a fit, such as convulsive twitchings of the face, startings during sleep, inward bending of the thumbs upon the palms of the hands, the fingers being doubled over them; a somewhat similar condition of the toes and squinting. When a fit occurs the child becomes deadly pale, the features are distorted, the eyes stare and are rolled about, the breathing is irregular and catching, the body becomes rigid, and the hands are clenched. All this may happen in a minute or less, or it may occupy five minutes, a quarter of an hour, or even more. The more violent the convulsion, the shorter the attack usually is, and " vice versa ". When the fit is over, the child comparatively resumes the appearance of health, a perspiration succeeds, and he falls into a sound sleep.

A child seldom dies in a fit, but of such a catastrophe there is danger when spasmodic closure of the air passages takes place. In that event the face becomes purple, the head is bent backwards, violent efforts are made to breathe, a crowing noise like that of croup is made as the air tries to pass through the narrow chink, but it becomes fainter and fainter till it eventually ceases altogether or a louder and prolonged sound proclaims relief.

Convulsions, however, do not always take the typical form of a single generalised fit with twitching and unconsciousness; there may be what is known to mothers as " inward convulsions ".

In this condition there is sudden pallor, momentary loss of consciousness, upward movement of the eyes, slight twitching or jerking and a catch in the breathing. Such attacks should not be disregarded, at best they are an indication of a dangerous degree of nervous excitability and they may be a prelude to more marked and general convulsions.

Rapidly recurring convulsions.—In this condition the fits follow one another with such rapidity that the child barely recovers consciousness between the attacks. Unless active measures are taken, there is considerable danger of death from exhaustion.

One-sided convulsions.—The rigidity and twitching start in the limbs on one side of the body only, in the course of the attack the twitching may pass to the other side of the body and the convulsion become general. Sometimes, however, the condition remains confined to the side on which it started. Such unilateral conditions are suggestive of actual organic brain disease, but in many cases the condition passes off leaving no trace.

Age.—Convulsions occur most commonly within the first two years of life. There is little doubt that some infants are more prone than others, that is, the condition which will excite convulsions in one child, will fail to do so in another. In other words, the nervous instability, which is a feature of early childhood, is more marked in some children than others. This instability may be inherent in the child and in many cases is no doubt hereditary, while in others the instability may be induced by some generalised constitutional disorder, notably rickets, or temporarily by the eruption of the teeth.

The CAUSES of convulsions are :—

(1) *The onset of an acute disease,* especially of one of the infective fevers or malaria. In young children, the rigor or shivering attack which as a rule ushers in an acute fever in the adult, is unusual, its place being taken by a convulsion. A notable exception is seen during the onset of the acute pyelitis of infancy in which the shivering attack is sufficiently characteristic to suggest a diagnosis.

(2) *Reflex irritation.* By far the largest number of cases in early infancy and childhood are due to causes which come under this heading and conspicuous among them are those due to irritation within the bowel, whether it be *constipation, colic, gross errors of diet, worms or tight prepuce.*

Earache also is a frequent and often overlooked cause.

Teething.—It must be accepted that during the period of teething, the liability to convulsions is increased, but whether

this can be ascribed to actual irritation of the gums is doubtful. It must be remembered that during the eruption of the teeth, the nervous system is in an exaggerated state of excitability and causes, which are insufficient at other times, will now be rendered active. Fright has been known to cause convulsions, and there are those cases in which the child literally cries itself into a fit, though such cases should be more properly ascribed to congestion of the brain.

(3) *High fever.*—Here again the occurrence of convulsions would seem to be dependent, not so much on the height of the fever as on the particular predisposition of the child, otherwise we should be able to state definitely at what degree of fever the convulsions will supervene.

(4) *Toxic.*—A condition of poisoning, whether from substances produced within the body by the action of bacteria or through some morbid change of the body chemistry. As an example of the first class, the convulsions associated with acute infective enteritis may be mentioned and of the second, convulsions in acetonæmia. It is to be remembered that in the last-named condition the convulsions may be due to the exhaustion of the blood-sugar, as indeed may be the case in other exhausting diseases.

Finally, under this heading must be mentioned the convulsions of uræmia, when the blood is flooded with poisonous bodies which the diseased kidney is unable to remove.

(5) *Anæmia of the brain.*—Attributable to this cause are those cases arising during the course of a prolonged exhausting disease.

(6) *Congestion of the brain.*—Most important in this class are the convulsions induced during the violent paroxysms of whooping-cough, for rupture of a vessel and hæmorrhage may ensue.

Congestion of the brain may also arise in the course of certain acute diseases, notably pneumonia, leading to the condition of meningismus, which, though closely resembling meningitis, has but slight physical basis, and, as a rule, passes off.

(7) *Actual brain disease.*—In the first few days or weeks of birth the occurrence of convulsions will suggest some injury of the brain or hæmorrhage during birth. Such cases, though alarming, are not necessarily fatal and may leave no permanent results. Later, the chief organic brain disease is meningitis in any form. In such cases, there will have been definite signs of the disease before the supervention of convulsions.

(8) *Epilepsy.*

(9) There are lastly those cases in which no cause of any sort can be found.

It is clearly of the utmost importance to discover the cause, because, though our immediate treatment will be directed towards the relief of the convulsive state, this treatment may be rendered of no avail by the onset of further convulsions induced by the still active cause. Secondly, though the general line of treatment is the same, some special line will also be indicated by the underlying cause.

Standing out as demanding special immediate treatment are those cases arising from a high temperature. Here the first efforts will be directed to the reduction of the temperature to within safe limits by immersion of the patient in the tepid or cold bath. The condition can hardly be overlooked; the mere handling of the child will bring enlightenment as to the state of affairs.

This cause having been excluded, the next step is to distinguish between those convulsions which have arisen when the child is in apparently good health and those which have occurred in the course of an illness of which a diagnosis has in all probability been made.

When the seizure is sudden without previous illness, we must consider three points :—

(1) Is there any condition such as rickets or teething to induce a predisposition ?

(2) Are we dealing with the onset of an acute disease or malaria ?

(3) Has there been any gross error in diet or any slight departure from the normal habits, such as a failure of the regular evacuation of the bowels ? (Constipation, though apparently a trivial cause, may give rise to the most severe or recurrent convulsions.) Are there any other sources of reflex irritation, earache or swollen gums ?

When there has been previous illness, we should know whether there has been a sudden rise of temperature or exhaustion.

One special word on the point of diagnosis is desirable, that is, that efforts at exact diagnosis should not be pushed to such a degree as to risk provoking further seizures. The immediate necessity is the control of the convulsive state, and until this has passed, the child should not be disturbed by a too rigorous examination, but should be allowed to sleep if it will, and the examination postponed till a more favourable moment.

The *treatment* may be divided under three headings :—

(*a*) Treatment of the attack.
(*b*) Prevention of convulsion in those threatened.
(*c*) Treatment of the underlying cause.

Unless there is high fever (*see* above) the child is immersed quietly in a hot bath (temperature 100° to 105°Fahr.). To this may be added mustard (one tablespoonful to a gallon of water). The child is kept in the bath for about five minutes, hot dry towels being made ready to receive him. He should be handled with the greatest care, and should not be rubbed down after the bath, but wrapped in the towels and blankets added if necessary. A cold compress may be applied to the head.

As soon as the child can swallow, a dose of chloral and bromides or luminal should be given (for doses *see* below).

A simple attack will now be over and the child should be allowed to sleep undisturbed.

Should the case have been induced by exhaustion, stimulant in the form of a few drops of sal volatile added.

If the fits are very severe and fail to yield to the foregoing treatment, or the child is unable to swallow, the bowel will be washed out with saline solution (one teaspoonful of salt to a pint of water) and after this, a dose of chloral and bromide given by the rectum (for dosage *see* below).

During this process and until the chloral has had time to act, the convulsions may be controlled by inhalations of chloroform. In the worst cases morphia injection grain 1|100th to 1|50th to a child of one year old may be given.

Professor Still has recommended the use of urethane grain one three times a day to a child of one year of age and from three to eight grains to a child of six, when the fits succeed one another with great rapidity and are persistent.

Dosage of chloral and bromides :—

	Chloral.		Pot. Bromide.	
Age.	By mouth.	By rectum.	By mouth.	By rectum.
Few days	grains ½	grains 1	grains 1	grains 2
Six months	„ 1	„ 2	„ 2	„ 4
One year	„ 2	„ 4	„ 4	„ 8

Repeat in an hour if necessary. May be repeated three-hourly.

Older children, dosage in proportion.

As an alternative luminal grain ¼ at one year, repeated after 3 hours or at shorter intervals if necessary.

The repetition of the dose is a matter which calls for judgment; so long as there is any sign of irritability or sleeplessness, the sedative must be used actively, but if the child is drowsy or sleeping, it should be cut down or temporarily omitted.

Great pains should be taken to encourage the sleep which usually succeeds convulsions. By means of the potassium bromide, rest may be always assured in cases where restlessness succeeds the fit, and a grain of chloral for each year of life may be added to the first dose. Till sleep is procured, there is always danger of a recurrence of the seizure. The most perfect quiet should be observed. No attempts should be made to play with the child or to amuse him after he has recovered his senses. Subsequently for a few days he should be put on a spare diet, and a *free evacuation of the bowels ensured.*

If the cause of the seizure has not been apparent, every effort should now be made to discover it, for, however well the patient may seem after the fit, the cause may still be there and potent to produce a repetition. It may have been improper food, indigestion, worms, flatulence, or other cause against which, when the accusation has once been established, precautions should be taken during the whole of childhood.

In the list of causes we have an outline of the preventive treatment. We know that in certain conditions there is a peculiar liability, we first take steps to avert these conditions by such means as the reduction of high temperatures, the giving of stimulants in exhaustion or the active treatment of rickets, and we endeavour to forestall any seizure by the administration of such drugs as bromides or phenazone (grain one daily to a child of one year) in such cases as, by premonitory symptoms, we are warned. These " warnings " have been mentioned in the opening section of this chapter, but may be repeated; twitchings of the face or limbs, starting during sleep, clenching of the hands, a somewhat similar condition of the toes, and lastly, persistent sleeplessness.

The single simple convulsion is seldom fatal, but in making a forecast we shall be governed by three considerations; the type of the seizure, whether short, prolonged or recurrent, the underlying cause and the exhaustion following the attack. Of serious import are :—

(*a*) Convulsions during the first few days of life as suggesting some injury or hæmorrhage of the brain during birth. Also they are grave if there have been preceding signs of disease of the brain.

(*b*) Rapidly recurring fits, especially if there is cyanosis (blueness).

(*c*) Convulsions in the course of a serious illness, as they are the indication of a profound state of exhaustion or poisoning and may, indeed, be the terminal event.

CONVULSIONS AND EPILEPSY.

It is rare that convulsions, save those actually associated with disease of, or injury to the brain, lead to permanent impairment of the mental faculties.

There is also no evidence that convulsions in early childhood will induce a tendency to epilepsy, but it must be remembered that fits without any apparent exciting cause may be epileptic in origin and will declare themselves as such in later years.

It is beyond the scope of this work to deal in detail with the subject of epilepsy, but the main principles of treatment are as follows :—

1. *During the attack.*—The patient must be prevented from injury, a low pillow should be placed beneath the head and the teeth must be separated and kept apart by a suitable wedge which may be conveniently made from a small tight roll of paper, to prevent him biting the tongue. The clothes should be loosened, but nothing further need be done. After the attack he should be allowed to sleep till he awakes naturally.

2. *Prevention of attacks.*—Sedative drugs, preferably luminal and bromides in combination, are administered daily in sufficient doses to prevent attacks and the treatment is maintained until fits have been abolished for at least a year. The drugs are then reduced gradually. Luminal must not be left off abruptly, but always by gradually diminishing the doses.

The initial dose for a child of four would be luminal grain ½, potassium bromide grains v, twice a day, the dose to be increased if the fits are not controlled and gradually diminished if no fits occur. In the case of fits at night, one dose should be reserved for bed-time.

3. *General management.*—All forms of excitement should be avoided and the child should not go to school at any rate until the fits have been absent for three months, as the strain of long hours of lessons may be provocative. On the other hand the child should live as normal a life as possible. Suitable congenial occupations should be found and lessons arranged to suit the child.

Regular exercise should be taken, but bathing and swimming should be forbidden.

Care should be taken to ensure a regular evacuation of the bowels.

CROUP.

Definition.—The term croup signifies a temporary obstruction in the upper airway leading to difficulty in breathing. The obstruction is situated in the larynx and may be inflammatory, induced by laryngitis; it may be due to spasm of the muscles of the larynx with closure of the passage, or it may be due to a combination of the two.

The characteristic feature of the attack is the loud crowing noise which accompanies each indrawn breath and the signs of increasing suffocation which pass off as soon as the obstruction is relieved.

Varieties.—The varieties of croup may therefore be separated into two groups—nervous and inflammatory—and classified as follows :—

(1) *Nervous.*

(*a*) *Spasmodic laryngitis* (*Laryngitis stridulosa*), a condition of childhood, starting usually about the third year but to be encountered from the ages of one to ten.

This disease is characterised by the occurrence of periodic attacks without warning at intervals, it may be of months.

The liability to this disorder appears to be inherent. There is no previous illness, there is no discoverable alteration in the general health which might cause a predisposition and the immediate exciting cause is slight, exposure to a cold wind, an overloaded stomach or over-excitement.

The attack usually starts in the night with a dry cough passing on to an increasing difficulty in breathing. The attention is called to the throat as to site of the obstruction by the loud crowing or inspiratory stridor. The child struggles for breath, is bathed in perspiration and the face grows more and more livid. After some time, it may be from one to two hours, the condition passes off, the child falls asleep and on the following day there is no trace save possibly the evidence of a disturbed and exhausting night. This disorder is therefore markedly different from the second variety.

(*b*) *Child-crowing* (*Laryngismus stridulus*). Child-crowing is but one manifestation of a general convulsive tendency and indeed may be accompanied by other convulsive signs. It is induced by the same conditions which produce convulsions; rickets, teething in the sickly child, severe digestive disturbance or gross errors of diet. Child-crowing is more frequently met with in the earlier months of the child's life, between six months and two years. The incidence is relatively high among children

artificially fed on account of the increased tendency to digestive disturbances or rickets. The paroxysm starts with a crowing sound or the child holds its breath and grows black in the face. After a few seconds, the spasm is released, air is drawn through the still narrow chink in the glottis with a shrill crowing sound and the attack is over for the moment though others may follow in quick succession. The child gradually regains the normal colour and drops off to sleep. Such attacks may be provoked in the susceptible child by violent crying or coughing.

Such conditions must be always regarded as serious as they are an indication of a general convulsive tendency. It is, however, but rare that the spasm continues for such a time that the child succumbs to suffocation.

(2) *Inflammatory.*

(*a*) *Acute laryngitis.* Affections of the air-passages are in early childhood apt to take a more severe form than in adults. In catarrhal inflammation of the larynx not only are there high fever, 102° to 103°F., and severe constitutional disturbances, but there is also a tendency to the development of a dangerous form of laryngeal spasm.

At first there are all the symptoms of a common cold, with fever, thirst, drowsiness and running from the nose. The child complains of or snatches at the throat and the voice is husky. The cough is troublesome and painful. The fever increases and all symptoms continue for 24 to 36 hours. At night an attack of difficulty of breathing causes the child to wake in fright, gasping for breath. The paroxysm passes, but during the rest of the night the cough, crowing and impeded respiration continue to some degree leaving the child exhausted in the morning.

A slight improvement succeeds and a little sleep may be obtained, but the relief is only temporary and other attacks may follow. During the attacks the face becomes livid, and the natural colour is not restored even between the paroxysms; that is to say, the condition is now one of continuous obstruction to breathing with periodic exacerbations. The amount of obstruction may be measured by the visible efforts to fill the lungs with air, the muscles of the upper part of the body and of the neck are at work and the skin between the ribs is sucked in showing that there is very little entry of air into the lungs.

(*b*) *Diphtheria* (formerly known as true croup). For full description *see* Chapter XXV.

The obstruction is here caused by three factors: the formation of a false membrane, the inflammation accompanying this and the spasm inseparable from all inflammatory affections of the larynx.

The first essential in treatment is to relieve the spasm which threatens suffocation to the child. The following immediate steps are taken :—Hot fomentations or sponge to the throat, steam inhalation and an injection of atropine sulphate grain 1/800 to grain 1/300 according to the age of the child. This should be given at the earliest possible time as it is the most effective of all remedies. Having warded off the immediate danger, we now proceed to a distinction of the variety with which we have to deal.

Should, however, the obstruction to breathing persist in spite of this treatment, we must consider the possibility of laryngeal diphtheria (*see* above) and prepare for tracheotomy.

The decision as to whether we are dealing with croup due to nervous or inflammatory causes should not be difficult.

With inflammatory croup there will have been previous signs, hoarseness, cough and fever. During the intervals between the acute paroxysms the difficulty in breathing does not altogether pass off. With croup—due to nervous origin—there will, on the contrary, be no preceding local signs, and with the relief of the spasm all signs of obstructed breathing will pass off. In child-crowing the attack is short, though it may be oft repeated and it is probable that there will be other symptoms pointing to the convulsive state, such as twitching or rolling of the eyes. Further, it may be that constitutionally there is some predisposing cause. The croup of older children will be distinguished by the length of the attack, the tendency to recur at longer intervals, the age of the child and the absence in the general condition of the child or any apparent exciting cause. When suspicion is aroused that we are dealing with a case of inflammatory croup, the greatest care will be exercised to distinguish between that due to laryngitis and that due to diphtheria. Diphtheria of the larynx seldom occurs without a primary invasion of the tonsils, except in children under two years, so that we shall, in all probability, be aware of the diagnosis before any urgent suffocative symptoms arise. In cases of doubt, a bacteriological examination is essential and, should there be the least hesitation in diagnosis, it is better to allow immediate serum treatment rather than incur the perils of the toxæmia of diphtheria (*see* diphtheria, Chapter XXV).

Not infrequently the extreme lividity and breathlessness of broncho-pneumonia are mistaken for croup, but these mistakes should not arise, as there is no stridor pointing to obstruction in the larynx. *Stridor* is the *one essential sign of croup* which distinguishes it from all other causes of breathlessness in children. Finally a form of laryngeal stridor, *congenital laryngeal stridor*

should be mentioned on account of the alarm it may occasion till explained. This is not a paroxysmal disorder, but is due to a congenital formation of larynx whereby with each inspiration a crowing noise is made. At the same time the child is quite undistressed and the crowing is continuous. The only importance of the condition is that with the slight narrowing of the larynx the child is more subject to respiratory disorders and more likely to suffer should they be contracted. The condition usually passes off before the child is two years old.

Treatment.—The treatment of the various types of croup is for easy reference summarised as under :—

SPASMODIC LARYNGITIS.

Avoidance of existing causes, cold winds, over-excitement, over-distension of stomach at night.

Arsenic in the form of liquor arsenicalis 1 minim three times daily for a child of 3, 2 minims three times daily for a child of 6. Course of a fortnight; followed by interval of a fortnight. If there is any sign of intolerance, sore eyes, nausea, or skin rash, the drug should be stopped at once.

During the attack.

Hot bath; hot sponge to the neck. If the child can swallow, chloral and bromide mixture No. 25 (*a*); atropine injection.

CHILD-CROWING.

Underlying causes such as rickets or intestinal disturbance to be treated actively.

If there is any evidence of irritability of the nervous system, the following will be found useful :—

Phenazone (Antipyrin) ..	gr. i.
Sodium bromide	grs. ii.
Vin. ipecacuanha	minims iii.
Carraway water	to one drachm.

Eight doses in 24 hours for a child of 2; 4 doses in 24 hours (i.e., six-hourly) for a child of one.

During the attack or immediately after.

Hot bath, hot sponge or fomentation to the neck—chloral and bromide mixture [prescription No. 25 (*a*)]; atropine injection; fresh air.

ACUTE LARYNGITIS.

From the outset, the aim of treatment will be the prevention of attacks of croup. The child is put to bed in a warm room;

poultices are applied to the neck and the mixture No. 31 will be given.

In cold weather, a blanket tent with one side open may be constructed over the bed with the spout of a steam kettle playing into it, but it is a matter of great importance that the child should not be half suffocated in a confined humid atmosphere. A teaspoonful of turpentine may with advantage be added to the water. An emetic is of special value if the symptoms are urgent. The bowels which are usually costive should be opened after the emetic by means of some such aperient as No. 3.

It is to be remembered that the more acute paroxysms are caused by spasm, superadded to the already existent inflammation. For this reason, the sedative mixture No. 24 or No. 25 may be given. Acute laryngitis is sometimes fatal and at all times may *give rise to the most urgent symptoms necessitating tracheotomy.*

Full details of treatment of diphtheria will be found in Chapter XXV.

SPASMOPHILIA.

Reference has been made at the beginning of the chapter to an acquired excitability of the nervous system induced by some disturbance of the body chemistry known as spasmophilia which may become manifest as general convulsions, local spasm in the form of tetany or in the form of croup known as "child-crowing" or laryngismus stridulus. Again no such signs may be present but their imminence may be demonstrated by certain signs of nervous irritability to be described later.

The varying manifestations are, as has been said above, most commonly associated with active rickets, but do not appear to depend on the gravity of the outward signs of this disease. Chronic digestive disturbance is the second most important cause, especially that condition known as cœliac disease.

Tetany is a cramp-like condition which attacks the arms and legs of the child. The position of the hands is characteristic; the fingers are straight, close together, but half bent towards the palm, the thumb is drawn inwards, the hand and fingers together are cone-shaped, in fact the hand assumes the attitude as if endeavouring to pass through a small bangle. The wrists and elbows are bent and a similar condition affects the feet. The condition is apparently painless except at the onset and lasts a varying time from a few hours to days.

The symptoms of child-crowing have already been described. Here the spasm attacks the muscles of the larynx, sometimes to such a degree as to cause death from suffocation.

It is clear, therefore, that it is of the utmost importance that the state of spasmophilia be recognised early.

Signs.—There are two simple tests of muscular irritability. The first, Chvostek's sign, consists of a twitching of the muscles on the same side of the face in response to a gentle tapping immediately in front of the ear, that is, over the facial nerve. The second, Trousseau's sign, is elicited by compressing the arm midway between the shoulder and elbow by the thumb and forefinger of the examiner. After a short while the hand assumes the characteristic attitude of tetany.

Such signs are an indication that the child is on the verge of some convulsive manifestation and call for immediate treatment with bromides or phenazone.

Authorities are agreed that in the majority of cases, though not all, the condition is due to want of calcium salts in the blood. This deficit unfortunately cannot be made up by the simple administration of calcium, as the power of absorption and retention of calcium is lost, but, in the case of rickets, active treatment with cod-liver oil and irradiation will rapidly restore this lost power.

Those cases due to gastro-intestinal disorder present a more difficult problem, as some are due to toxins absorbed from the bowel, others to alkalosis, while others, as in rickets, are due to a disturbance of the calcium balance. In general, the treatment is directed to the underlying causes, with a careful control of any tendency to hyper-excitability.

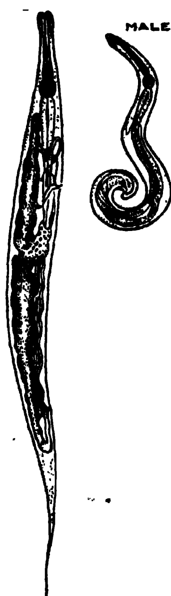
CHAPTER XV.

"WORMS".

The most common types of worm infection in India are :— threadworms, roundworms, hookworms and tapeworms. The infection is often by more than one variety at the same time.

I. *Threadworms* (*Oxyuris vermicularis*). Small white worms one-sixth to one-twelfth of an inch long residing in the cæcum (upper end of large bowel), females sometimes wandering out to lay their eggs in the folds of the skin.

Oxyuris vermicularis
(Threadworm).





Natural size.

Source of infection—other children, chiefly by infected finger nails contaminating the food. Infection is kept up by reinfection, the child scratches the skin round the anus which itches

intensely, particularly at night, collects the eggs from the worms on the fingers particularly under the nails and thus transfers them to the mouth so that the cycle begins again. Further, the fingers of the nurse may gather up the ova and so transfer them to the food.

Symptoms :—Itching round the anus, severe and leading to restlessness at night. Frequent passage of urine or bed wetting at night, straining at stool sometimes resulting in prolapse (*see* Chapter XII), mucus in the stools the result of irritation of the bowel. Sometimes in female children the worms wander into the vulva and cause serious irritation (*see* Chapter XVII).

Diagnosis :—From the above symptoms and from the presence of worms in the stools which may be revealed by a salt water enema if not otherwise apparent. They may occasionally be discovered in the folds of skin round the anus. Microscopic examination will reveal the eggs in the stools.

Treatment :—This consists in eradicating the worms and at the same time taking the utmost precautions that the subject does not reinfect himself. The worms lie chiefly in the cæcum and will not ordinarily be reached by an enema but they may be shifted by an energetic purge and those that have wandered down will be removed by the enema and so relieve the irritation. There is no specific cure but the worms will die out provided reinfection is prevented :—

1. The nails are clipped short and painted every morning by tincture of iodine.
2. The child wears pyjamas at night with a firmly tied string to prevent access to the anus.
3. An ointment is applied at night round the anus: ammoniated mercury 5 grains, vaseline to one ounce.
4. An enema of equal parts of quassia (cold water decoction) and normal saline solution, four to six ounces, is given every alternate night three times in all. A strong salt solution enema should not be given.
5. Constipation is prevented by a suitable aperient and occasionally a dose of salts may be given.
6. The nurse should remember that her fingers may be infected after attending the child and should wash them carefully in a solution of lysol.

II. *Roundworms* (*Ascaris lumbricoides*). This is a rare infection in infancy but is common in childhood in spite of all precautions. In appearance the worm is pinkish white, smooth, cylindrical, tapering at both ends, from 4 to 12 inches in length. The infection may consist of one worm or many inhabiting commonly the small intestine. Source—uncooked vegetables or

contaminated water or food. Reinfection may take place through the finger tips as in threadworms.

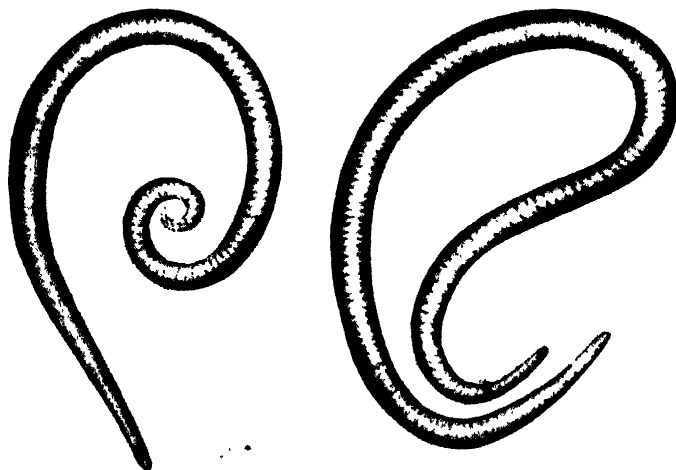
The symptoms are variable though the worm is responsible for many cases of ill health, dyspepsia or delayed progress. Sometimes the worm gives no signs of its presence even though there may be a number but in all illnesses a worm will tend to aggravate the symptoms particularly those of the nervous system. As a rule some of the following signs will be observed and suggest a diagnosis :—

Digestive :—irregular appetite, sometimes voracious sometimes absent, abdominal pain, vomiting, constipation alternating with diarrhœa.

Nervous :—irritability of temper, teeth grinding, nail biting, nose picking, twitching, convulsions, very rarely paralysis.

Other signs :—Abnormal cravings of appetite, cough, rarely asthma. The worms are sometimes vomited or passed spontaneously and this is particularly liable to happen during high fever and may even be the first indication of an infection. There is

Ascaris lumbricoides.



Male. Female.

some dispute as to whether the infection of roundworms actually causes fever. The writer has seen a number of children suffering from fever somewhat resembling mild typhoid which has been brought to an end by the expulsion of roundworms.

The diagnosis is suggested by the presence of some of the above symptoms. In all cases of doubt the stools are to be examined for eggs or the child given a test dose of santonin.

Treatment :—First day, an evening dose of an aperient such as cascara, ordinary diet. Second day, the bowels having been opened a light diet consists of milk, Mellin's food and broth with a little toast. In the evening calomel and santonin are given after the following prescription :—Santonin grains 2, calomel grain 1, sacch. lact. grains 5, this powder is suitable for a child from six to eight years old. It is followed in the morning by a dose of salts and after the bowels have been well opened the child may resume its normal diet. A drug equally effective recommended by Dr. Maplestone is oil of chenopodium, the dose being one minim for each year of age up to the age of sixteen which is the maximum dose. It is administered in the early morning and a dose of salts is given half an hour later. When the bowels have been opened the normal diet may be resumed. The drug is preferably given by dividing the dose into three and giving it at intervals of one hour, followed by a saline one-half hour after the last dose. It should not be used under the age of two.

III. *Tapeworms.* There are two forms seen in India, *Tænia saginata*, derived from insufficiently cooked beef, and *Tænia solium* from pork. They are both rare. The worms are from ten to thirty feet long, one-third of an inch broad, divided into flat segments and with a small head, pin size. Habitat—upper intestine. Usually a single worm is harboured at any one time but multiple infections are also known. The adult worm may live in the human intestine for a long time even for a period of 25 years.

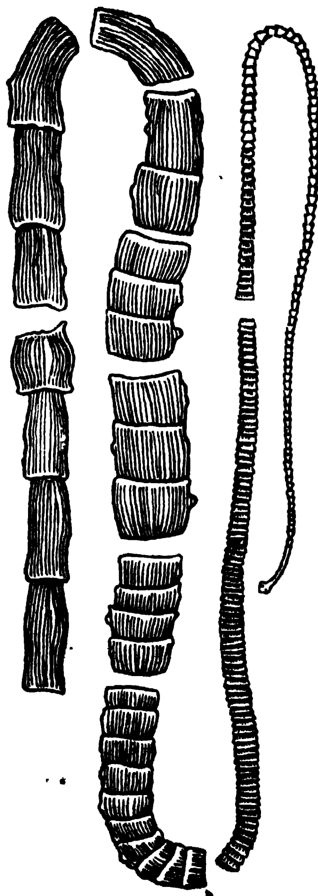
Symptoms :—The infection may be unsuspected until segments appear in the stools. Some proportion of subjects complain of special digestive disturbances; there may be vomiting, abdominal pain, and the appetite is irregular, sometimes being excessive. There may be failure to gain weight or stunted growth. The diagnosis is often difficult unless segments appear in the stools.

Treatment :—The treatment involves the ingestion of certain somewhat toxic drugs so should not be undertaken during periods of ill health. Precautions are especially important during treatment with carbon tetrachloride. No alcohol, even as a stimulant, should be given during the course or for two days after and the drug should not be given if there is any derangement of the liver.

Method I. Diet, moderate. Allow meat, eggs and milk for two days with very little bread, excluding vegetables, potatoes,

pastry or other starchy foods. Castor oil at night and in the early morning fifteen to twenty minims of extract of male fern (dose for a child of six divided into two doses at one hour intervals). The dose is made up as follows :—Liquid extract of male fern 20 minims, essence ginger 10 minims, glycerine 2 drachms, water to half an ounce. Mix, divide into two doses and give at one

Tænia saginata. (Beef tapeworm).



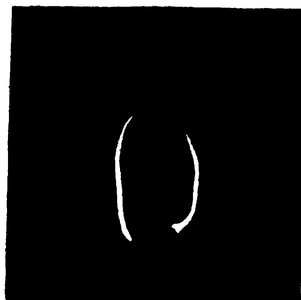
hour intervals. Castor oil is given four hours after the last dose and no food is allowed until the worm is expelled. During the passage of the worm efforts should be made to prevent its

breaking. A small enema may be given to assist the passage and preferably the stool should be passed into a bed pan.

Method II. (Dr. Maplestone). This method is regarded as the most effective method and eighty per cent. cures are obtained. A mixture as follows is made up :—Saturated solution of magnesium sulphate 2 ounces, carbon tetrachloride 45 minims. The two are placed in a four ounce stoppered bottle and shaken vigorously. The dose is calculated according to the age of the child, the fraction being as follows, age divided by age plus twelve, thus a child of four would take 4/16th or one-quarter of the adult dose. After four hours the dose of salts should be repeated and should no bowel action take place an enema should be given one hour later. No special preparation is required for this treatment except that the patient should have a light meal on the night before and food may be taken when the bowels have been well opened.

IV. *Hookworms* (*Necator americanus* and *Ankylostoma duodenale*). This worm is often found in association with *Ascaris* or threadworms. It is about half an inch long and the infection occurs in large numbers inhabiting the upper part of the small intestine. The infection is contracted most commonly through the skin. The larvæ flourish in soiled moist earth and penetrate the skin of those walking barefoot. It may also be derived from drinking contaminated water. The importance of this type of

Ankylostoma duodenale.
(Hookworm).

Female.  Male.

Natural size.

infection is that it causes a severe and progressive anæmia to such a degree that the patient is prostrated and may be in actual danger. It has been estimated by Darling that an infection of 12 worms causes a loss of 1 per cent. hæmoglobin in man. The number of worms, however required to produce well marked disease is from 500 to 1,000 for a period of six months. The

face is puffy as are also the feet. The abdomen is prominent and the tongue in advanced cases is white and bloodless to a degree seldom seen in other diseases in childhood. Occasionally dark patches may be seen on the surface. There is periodic diarrhœa sometimes with blood in the stools and there is frequently dyspepsia. The appearance of the child will at once suggest a diagnosis which will be confirmed by the discovery of the eggs in the stools.

Prevention :—Children in India must not run about in bare feet, unless in very favoured spots and must be prevented from playing with earth or sitting on the ground that has been open in any way to contamination. All drinking water must be boiled.

Treatment :—One hour after an initial dose of magnesium sulphate, carbon tetrachloride with oil of chenopodium in milk is administered. One hour after this a saline is given. The dose is as follows :—Oil of chenopodium 1 minim for each year of life and carbon tetrachloride in the dose suggested for tapeworm. Oil of chenopodium must not be given under the age of two. One hour later a dose of salts is given and once the bowels have been opened food may be resumed as before. Further active treatment for the anæmia is now required and in advanced cases liver extract is employed and for the milder cases we administer an iron tonic. We prescribe No. 30 and give liver and spinach soup twice a week, in addition to this fresh vegetables and fruits are given in abundance. Recently tetrachlorethylene is used instead of carbon tetrachloride in the treatment of hookworm. It is used in the same doses but has the outstanding advantage of being less toxic.

V. *Guinea-worms (Dracunculus medinensis)*. Guinea-worm is prevalent in certain parts of India such as Bombay, Bihar and Orissa and the North of India. This worm has an intermediate host in cyclops which inhabit water. The first sign of the worm is a small blister usually near the foot. This blister enlarges and the head of the worm will appear. The treatment consists in gradually extracting the worm by attaching the tip to a small piece of sterile gauze and winding very gently, great care being taken not to employ sufficient force to break the worm. As a rule not more than one inch can be extracted daily, the whole worm being some twelve to eighteen inches long and being wound in and out of the deeper tissues of the limb. The part must be kept strictly sterile by dressings and should the worm become infected or broken very serious suppuration may ensue. Other forms of treatment such as injecting quinine into the worm have been tried but this old method remains still the most efficient. Infections are prevented by using boiled water.

CHAPTER XVI.

DISORDERS AND DISEASES OF THE LIVER.

Children in the tropics are not infrequently the subject of transient disturbances of the liver function associated with digestive disorder. The cause usually lies in diet unsuitable to the climate with the possible added influence of chill. The symptoms are not severe and consist mainly of variability of the appetite, irritability, drowsiness, lack of energy, sometimes vomiting and often constipation. The tongue is thinly coated especially at the back with brown fur, the breath is malodorous and the complexion pasty. Such cases are likely to show acetone in the urine (*see* Chapter XIII). The liver is sometimes enlarged but quickly subsides under suitable treatment. For this condition the most effective treatment is calomel half a grain administered in divided doses at half an hour's interval, together with sodium bicarbonate grains v, followed next morning by a saline aperient. The bowels should be opened daily by a dose of sodium sulphate, one to two small teaspoonfuls in water, according to age, administered in water, the first thing in the morning. In addition the rhubarb and gentian mixture No. 13 may be given.

TROPICAL LIVER.

The term tropical liver, used by older writers, is somewhat difficult to place as, in the majority of cases where the liver is enlarged, we find a definite cause and need not fall back on this somewhat vague term.

MALARIAL LIVER.

There are two forms :—

(*a*) *Acute enlargement.*—During severe attacks of malaria the liver is swollen, painful and congested. The liver is liable to congestion in all forms of fever, but the enlargement does not reach the degree to be found in certain specific fevers such as malaria or kala-azar.

(*b*) *Chronic enlargement.*

(1) Directly due to malaria. Often associated with an enlarged spleen. The patient is subject to repeated attacks of malaria, the liver is enlarged and somewhat hard, the general

condition is the result of repeated attacks of malaria rather than to enlargement of the liver, that is to say, general ill health with anæmia. The enlargement is due to congestion and a deposit of pigment. There is no fibrosis so that with the cure of the malaria the liver will subside and resume its normal size.

(2) Due to general ill health and chronic gastric disorder, often aggravated by the prolonged use of quinine.

In both types the child is liable to fever, the appetite is poor and he loses weight. The skin is yellowish and the bowels irregular with a tendency to constipation. The first treatment is the prevention of the recurrence of malaria. We must satisfy ourselves that the infection is eradicated, but must not give quinine indiscriminately even when there is irregular fever, as this fever may be due to disordered liver function, rather than to malaria proper. Further, quinine has a directly poisonous action on the liver and interferes with the process of digestion. It should therefore not be given without due cause, nor continued over prolonged periods. A change of climate is particularly desirable as the child should be removed from all possibility of reinfection with malaria.

The diet must be arranged within the digestive capacity of the child, firstly, skimmed milk, Mellin's food and fruit juices. Later, using the appetite and the nature of stools as a guide, we make cautious additions of the more digestible items of diet. So long as the liver is enlarged and there is evidence of digestive disturbance, medicinal treatment must be calculated to stimulate the liver and digestive functions. Rhubarb and grey powder followed by an acid gentian mixture will prove effectual (No. 12). Later, it will be necessary to give iron, and if the case is advanced, liver extract, to cure the anæmia.

INFANTILE CIRRHOSIS OF THE LIVER.

This is a disease which has attracted much attention of late years but is not common and is mainly distributed in certain areas, chiefly in Madras and Bengal. The disease affects all races but is commonest among Hindus of the middle class. It has been recorded between the ages of five months and three years and is equally divided among breast-fed and bottle-fed infants. Several children in one family are apt to be affected.

As to the cause nothing definite has been ascertained. It has been ascribed to faulty feeding of the child and to improper feeding of the mother, especially as regards the vitamins, both before the birth of the child and during suckling, or to irregular artificial feeding with a super-abundance of fats or carbohydrates. None of these explanations are very satisfactory as thousands of

children are exposed to these vicissitudes without developing the disease. Certain facts, however, stand out. The first or curable stage suggests a congested and sluggish liver such as might well be associated with a chronic catarrh of the alimentary canal. The second stage, which is incurable, shows the morbid changes in the liver which are compatible with chronic bacterial invasion of the organ, that is to say are definitely of the inflammatory type.

The influence of chronic amœbic infection of the bowel has not been fully investigated. The final changes are not those of amœbiasis of the liver, but it may well be that in a certain number of cases, amœbiasis may be responsible for the initial lesion and that the path to subsequent infection of the liver may be laid open by amœbic ulceration of the bowel. The disease is prevalent where amœbiasis is prevalent, repeated examination of the stools may be necessary to establish the existence of amœbic infection but of late years we have realised that chronic infection of the bowel is exceedingly common in infants and young children and is responsible for a train of symptoms resembling those of chronic intestinal dyspepsia.

Symptoms of the first stage are those of intestinal dyspepsia and catarrh associated with deficient liver action, that is to say, alternating diarrhœa and constipation, stools often greenish and containing mucus, in periods of constipation, putty-coloured. Appetite poor, abdomen distended, face pinched, loss of weight, loss of tone in the muscles, eyes lustreless, lethargic, irregular periods of fever. The liver gradually enlarges reaching down to the umbilicus, but at first is not markedly hard.

In the second stage the liver hardens and in many cases the spleen is enlarged. There is anæmia and leucocytosis increasing as the disease progresses. Bacilluria is common. Fever is irregular, low at first, but rising later. In the final stages the liver shrinks, there is high fever, some fluid may collect in the abdomen and jaundice develops. Finally the child dies in coma from cholæmia.

Duration—in unchecked cases the diseases last three to six months.

Prevention—maternal hygiene and correct [illegible] with ample fresh air and sunshine for mother and child.

Treatment to be successful must be in the early stages and is the same as that for chronic dyspepsia. The diet is of the utmost importance and consists at first of whey only with water in abundance and fruit juices. The next stage is the addition of Mellin's food, and if all goes well the customary articles may

be gradually added leaving the addition of fat until the last. A daily mild aperient such as milk of magnesia is given and a rhubarb and grey powder twice daily for the first week. After this a mixture as follows :—Magnesium carbonate 2 grains, tincture podophyllin minim 1, infusion rhei minims 20, syrup of ginger minims 5, infusion gentian co. to 1 drachm, one dose three times a day before food. In some cases one-quarter grain of thyroid extract twice a day is beneficial but should not be given if the temperature is high. When there is definite evidence of bacillary infection of the urine an auto-vaccine may be administered and an urinary antiseptic as follows :—Hexamine grains 2, sodium salicylate grains 2, potassium citrate grains 5, sodium bicarbonate grains 5, syrup simplex 10 minims and aqua carui 1 drachm.

The prognosis is bad once the liver has hardened and the fever is high and persistent. Finally, a diagnosis must not be made hastily and other causes of enlargement of the liver detailed in this chapter must be excluded.

AMŒBIC LIVER.

Owing to the fact that young children very seldom show signs of amœbic dysentery, the impression has gained ground that children are immune to amœbic infection. This is far from being the case, chronic amœbiasis of the intestine is extremely common and as stated above presents symptoms rather of a catarrhal intestine or of chronic intestinal dyspepsia. The liver is sometimes affected and becomes enlarged, slightly hardened and tender. This possibility must always be considered, before we diagnose infantile cirrhosis. If we are to rely on laboratory tests to confirm our suspicions we must not be content with one perfunctory examination. It is notably difficult to discover the amœbæ in such cases as they are embedded in the walls of the intestine and are frequently not discharged. A series of not less than six examinations must be performed when the stools are loose and fresh before we can be satisfied that a reasonable test has been made.

Though amœbiasis is exceedingly common, and we not infrequently see an enlarged liver due to this, liver abscess, the comparatively common sequel in the adult, is of so great a rarity as to call for record whenever it occurs.

For treatment of amœbic infection of the liver *see* under amœbiasis.

OTHER FORMS OF ENLARGEMENT.

Two other important forms of enlargement of the liver, kala-azar and rickets, are described in separate chapters. Specific

enlargement of the liver due to inherited constitutional disease is rare in India. Periodically we meet with a congenital enlargement of the liver associated with other signs of disease, general wasting, skin rashes and slight jaundice. In such cases the outlook is not good but treatment with inunction of mercury and small doses of potassium iodide must be started at once and continued until the child is thriving, when further antispecific treatment will be taken up.

CHAPTER XVII.

DISEASES OF KIDNEYS, BLADDER AND OF NEIGHBOURING ORGANS.

GRAVEL OR STONE IN THE URINARY TRACT (*see* also page 128).

Gravel. By gravel is meant the passage in the urine of salts which have fallen out of solution and agglomerated together to form particles of perceptible size. These particles coming into contact with the sensitive tissues of the urinary tract set up intense irritation and pain resulting in attacks of violent colic. Often associated with this is a pinkish deposit of urates on the napkin. The cause of this condition is usually gastro-intestinal disturbance and treatment should be conducted with a view to preventing fermentation. The child is placed in a hot bath for fifteen minutes and alkaline diuretics are given three-hourly, potassium citrate grains 5, potassium acetate grains 5, aqua carui to two drachms. Fluids are given in abundance.

Stone in the kidneys or bladder is occasionally seen, and is common in Northern India. A stone of the kidney will give rise to pain in the back and violent colic after it becomes dislodged, with blood in the urine. If forming in the bladder the most prominent symptoms will be pain immediately after passing urine or the passage of urine may be interrupted.

ACUTE INFLAMMATION OF THE KIDNEYS (ACUTE NEPHRITIS).

The origin of this disease is somewhat obscure but commonly in this country it arises after one of the following :—Septic skin rashes, such as not infrequently follow scabies, chill or a focus of sepsis, especially in the tonsils or the middle ear, and septic bone diseases. A prominent cause in Europe, scarlet fever, is so rare in this country that as a promoting factor it may be disregarded. The main features of the disease are as follows :—the onset is sometimes sudden with shivering or convulsions, at other times gradual, there is nausea, vomiting and a general feeling of ill health. The first point which may strike parents is the presence of œdema, that is to say accumulation of fluids in the tissues under the skin, most markedly on the face, hands and feet. Later in more severe cases the œdema may become generalised and there actually may be fluid within the abdomen (ascites). Fever is present in varying degrees.

The diagnosis will rest upon the examination of the urine in which there are marked changes. There is a serious diminution in quantity, sometimes down to an ounce or less in the twenty-four hours. It is dark and smoky coloured and in some cases contains so much blood as to be bright red. Chemical and microscopical examination reveals that the urine contains a large quantity of red blood corpuscles, albumin and casts. In the majority of cases there is a gradual return after ten days or so to the normal with increase in the amount of urine and the resumption of its normal appearance, at the same time the dropsy disappears. There is, however, a tendency in such cases to pass into the latent state with periodic exacerbations or relapses.

If the case passes into what is known as the subacute or latent state, there is a persistence of albumin in the urine, the dropsy does not clear away entirely or clears only to reappear at intervals and there is a steady development of anæmia. The course of this stage is often prolonged and irregular with periods resembling those of the acute stage and periods of comparatively good health. The ultimate outlook, however, is very grave as there is a steady destruction of the kidney substance leading eventually to failure in function. During this stage, moreover, the child may fall a victim to intercurrent maladies, particularly to broncho-pneumonia or some infection of the alimentary canal. A very limited number of cases pass into the chronic stage which is more a disease of adult life.

In the treatment of the acute stage we aim at sparing the kidneys by absolute rest and aiding elimination of toxic substances through the bowels and the skin. The child is confined to bed and in the cold weather is placed between woollen blankets rather than sheets. The amount of fluid taken is strictly limited to a pint or less in the twenty-four hours according to the output of urine. Feeding is purely of carbohydrate, Mellin's food or glucose.

The bowels should be opened freely every day, firstly with a purgative such as pulv. jalapæ co., dose according to age and subsequently with a daily dose of saline. The action of the skin is promoted by hot sponging. When the amount of urine is seriously diminished hot packs or hot linseed poultices to the loin or dry cupping may stimulate the flow but no drugs of the active diuretic class, that is, calculated to stimulate the kidney directly, are permissible. A mild alkali such as pot. citrate grains 20 in water three-hourly may be given as the urine is highly acid.

Convalescence is prolonged and proteids should not be added to the diet until there is a free flow of urine. The greatest care should be exercised so long as there is albumin in the urine and

the child should not be allowed to pursue his ordinary life till the urine has been albumin free for three months. During this time the diet may approach the normal and an iron tonic (No. 28) is administered.

If the disease passes into the subacute phase, special attention must be paid to feeding suitable to the stage, as the kidney cannot recover in a state of malnutrition nor can a proper flow of urine be established without a sufficient percentage of urea in the blood. Further, there has been a heavy loss of protein through the urine which must be replaced. At such stages a blood analysis will be of the greatest help, but when this is not available we must work on our clinical observations.

The following points suggest that additions of further proteid to the diet are necessary. A persistent œdema with a moderate reduction of the amount of urine, and marked anæmia. The additions are made in the form of milk, eggs and fish.

Attention is still necessary to elimination through other channels and free action of the bowel and skin must be ensured. At this stage mild alkaline diuretics combined with iron are useful and the most valuable mixture is Basham's mixture as follows :—Tinct. ferri perchlor. parts 4, dilute acetic acid parts 6, liquor ammon. acetat. parts 50, aromatic elixir parts 12, glycerine parts 12, water to 100. Dose, adult 2 to 4 drachms, children proportionate.

In some cases, where the œdema is persistent, thyroid extract grains 1 to 2 a day is effective in promoting a free flow of urine.

Children must be kept in bed till all signs of active kidney disease have passed away and after this must be carefully guarded against chill or overfatigue. They should not go to school for a year after convalescence. A change of air is beneficial, but it should be at the seaside rather than in the hills.

Any septic foci, tonsils, teeth or of the skin should be treated.

Bacillus coli INFECTION.

The *Bacillus coli*, the normal and harmless inhabitant of the bowel, sometimes escape into the blood or lymph stream where it becomes an abnormal and harmful inhabitant, and is of the nature of an infection. This infection may remain in the blood stream giving rise to fever of obscure causation, but more commonly settles down in the urinary tract, again giving rise to a characteristic fever, with the presence of pus and large numbers of the organisms in the urine. The cause of this migration is to be found in some breach of surface in the mucous membrane

of the bowel, the result of constipation, ulceration, very frequently of amœbic infection and possibly of worms. The disease occurs at all ages and has been observed in an infant of two months.

The main features of this fever are :—A sudden onset with shivering, very rarely convulsions, frequent abrupt rises up to 104° to 105°F., short duration of the height, equally abrupt descents to or below normal, twice or more in the twenty-four hours. A striking point in older children is the relatively slight constitutional disturbance except at the height of the fever and the quick recovery of comfort and spirits as soon as the temperature falls near normal. In infants the constitutional symptoms are marked and even grave, including a tendency to twitching or convulsions. The duration is from one to three weeks, unless controlled and there is a tendency to relapse.

In all cases of high fever of sudden onset the urine should be collected and examined in a clear glass vessel for opalescence. Chemical examination will reveal that the urine is acid and there may be a trace of albumin. Microscopic examination will show the presence of numerous pus cells and micro-organisms. Culture of the urine, unless withdrawn through a catheter, is useless in the female. In any case a positive culture of *B. coli* is not a conclusive proof of infection unless there are also pus cells in the urine. In older children some hint of the site of the trouble may be gained from pain or tenderness in the loin.

Treatment.—The urine must be kept alkaline for ten days. At the outset sodium citrate and sodium bicarbonate, of each ten grains, dissolved in water are given every two hours and this dose is maintained until the urine, as tested by litmus paper, is found to be alkaline. The dose is then given four-hourly and the urine tested each time it is passed. If the urine remains alkaline, the mixture may be further reduced to three times a day, but must again be increased if there is any sign of returning acidity. In older children Euflavine capsules grain ¼ to ½ may be given twice a day in addition.

In obstinate cases the treatment may be reversed after ten days and an acid mixture of Hexamine given (No. 36). This should not be employed if there is much irritability of the bladder or if there is blood in the urine. Vaccine treatment is not advised except in chronic cases with a tendency to relapse. During the acute stage the diet should be fluid and the child encouraged to drink large quantities of water. Finally, during treatment for the actual disease, attention must be paid to the underlying cause and disorders or infections of the intestine corrected.

INFECTION BY OTHER PYOGENIC ORGANISMS.

The urinary tract may be the seat of infection by other organisms, streptococci or staphylococci. The general course of the disease is similar to *B. coli* infections, but is likely to be more severe and the patient more affected by the toxins of these more virulent organisms. The source of infection is usually the tonsils, either as the sequel of acute or chronic septic tonsillitis. The distinction of the organism can only be made in the laboratory, but the urine is more likely to be alkaline instead of acid, as in *B. coli* infection.

Treatment.—The urine must be kept acid with sodium acid phosphate and the Hexamine mixture No. 36 given. This should not be given if there is blood in the urine or any marked albuminuria. In addition, quinine grains 2 three times a day is valuable as a mild diuretic and possibly adds its quota to the general antiseptic effect. As an alternative, where there is much irritation a mild alkaline diuretic may be given (No. 21) together with Euflavine.

The throat calls for special examination for obvious septic patches or enlarged glands and if such are present the tonsils are painted three-hourly with throat paint No. 35. If there is a history of recurrent tonsillitis with enlarged glands in the neck, it is evident that there is persistent infection of the tonsils and they should be removed at a later date. Not the least important is the period of convalescence. It is held that the kidney is rendered susceptible to trauma or injury such as may be sustained in the vigorous movements of childhood. Bearing this in mind, it is clear that the patient must remain in bed for at least ten days after the temperature has come down and the urine is free from pus cells.

VAGINAL AND LABIAL DISCHARGES.

These conditions are by no means uncommon in India and are met with in schools and private houses alike. The milder form is due to lack of cleanliness, threadworms or is found in debilitated children. The more severe form is due to contamination and the discharge is highly infective. This may arise through infection from servants and possibly from infected commode seats, though in some cases no direct infection can be traced. Whenever there is a profuse purulent discharge, a microscopic examination must be carried out without delay.

In the mild type of case the symptoms are few and all that is necessary is attention to cleanliness, the treatment of threadworms and the administration of general tonics. In the more

severe cases due to specific infection (gonococcus) there may be much pain or discomfort on passing urine, the parts are red and swollen and there is a profuse yellowish discharge.

Treatment consists firstly in immediate isolation of the child. The attendant should be careful to cleanse the hands after tending the child and everything used for or by the child should be kept and washed separately.

The chief therapeutic measures are :—

1. Hot antiseptic and alkaline hip baths, twice a day.

2. The vagina is douched out 2 to 3 times a day, using a glass catheter connected by rubber tubing to a funnel.

Solutions—a quarter per cent. picric acid, acriflavine 1—1,000 or a weak solution of potassium permanganate. The parts should be carefully dried after douching.

3. At bed-time a medicated bougie of protargol should be inserted. Sometimes, if there is pain in the urethra, a urethral bougie is also useful.

The acute signs of the disease disappear rapidly under treatment but a long time may elapse before the chronic discharge disappears and relapses are common.

Fortunately, there are not many complications of this distressing condition; rarely cystitis (inflammation of the bladder) may occur or the infection spread to the rectum. Under careless management, the infection may be carried by the hands of the child to the eyes, resulting in intense inflammation which may permanently damage the eye (*see* Chapter XXIX). In exceptional cases the inflammation has spread from the vagina to the uterus and pelvis setting up pelvic peritonitis. Rarely also, one or more joints may become acutely inflamed (gonococcal arthritis).

The usual duration of these cases is from two to six months. The resistant case may be treated by giving the child an anæsthetic and swabbing the vagina with ten per cent. protargol or two per cent. mercurochrome. Thereafter the vagina is irrigated twice daily with hypertonic saline solution or two per cent. protargol.

All underlinen and pads should be changed frequently.

CHAPTER XVIII.

CERTAIN RESPIRATORY DISEASES.

Cold in the head.—The subject of respiratory diseases may be opened appropriately with some few words on the subject of the "cold in the head". Though not unnaturally regarded as trivial, such colds when affecting the nursling are liable to give trouble for three reasons: (*a*) the blocking of the nose renders sucking difficult, (*b*) the child is forced to breathe through the mouth and consequently the infection is liable to spread to the bronchial tubes, (*c*) the infant is unable to get rid of the semi-purulent mucus which is swallowed and gives rise to intestinal catarrh. It is remarkable how often the common nasal catarrh is, in the infant, followed by gastro-intestinal disturbance of greater or less degree. For these reasons the obstruction should be relieved by instilling warm nasal drops (white sugar grains 4, sodium chloride grains 2, sodium bicarbonate grains 2, water 1 ounce) every two or three hours. The drops to be instilled warm with a medicine dropper. Such drops loosen the mucus and cause sneezing, whereby it is expelled.

In addition to this local remedy a small dose of grey powder grain ¼ to ½ may be given twice daily and the chest is rubbed daily with a stimulating liniment made up of equal parts of turpentine liniment and olive oil, with the object of preventing the catarrh from spreading to the bronchial tubes.

Colds of this nature are often associated with a slight sore throat which, in older children, may with advantage be treated with the throat paint No. 34 and the following mixture :— Creosote minim ¼, ol. cinnamoni minim ¼, tincture of garlic minims 5, glycerine one drachm, chloroform water to 2 drachms. Two teaspoonfuls thrice daily to a child of two.

COUGH.

One of the most common complaints which, in the infant and young child, calls for investigation is the cough. The cough may be associated with other symptoms pointing to some disorder of the respiratory system, but on the other hand, cough is a symptom or accompaniment of troubles so diverse that it is difficult to exhaust the possible causes.

The *causes of cough* may be divided into two main groups: —(*a*) Those connected and (*b*) those unconnected with

respiratory disease. Of the first group we may make further subdivision :—

(1) The cough excited by the presence of excess of mucus within the bronchial tubes. When the mucus is fluid and easily movable such cough is spoken of as the loose cough and is serving the useful purpose of expelling the mucus, though in infants and young children much of the benefit is lost as there is no power of expectoration, so the mucus is merely swallowed or drawn back into the bronchial tubes.

(2) The dry or unavailing cough, excited, not by the presence of movable mucus in the air passages, but by inflammation or irritation in any part of the respiratory system. Such a cough is to be heard in the early stages of bronchitis or inflammation of the lungs, in pleurisy, or when pressure is exerted on the main bronchial tubes by enlarged glands due to whooping-cough or tuberculosis.

When consulted as to the cause of a cough, our first step is naturally to search for any disease of the lungs or bronchi. Such disease may be made manifest by shortness of breath, wheezing or rattling of the chest, or in older children by expectoration, but a more thorough examination may be necessary before the cause is revealed. Failing to discover cause within the chest, we shall pass on to consider the next, by no means small group of causes, not connected with actual disease of the lungs or air passages.

Examination of the throat may reveal *enlarged tonsils* or *adenoids* leading to mouth breathing and so to irritation of the throat, relaxed uvula, post-nasal catarrh and chronic laryngitis or pharyngitis.

One of the most common causes of persistent and troublesome cough, especially at night when the child lies on the back, is the remnant of a cold in the head. There is still some discharge from the back of the nasal cavity which trickles down and irritates the back of the throat. Treatment will be directed to clearing this catarrh with the nose wash mentioned above, and the cough may be allayed by a hot drink or the administration of a simple linctus made by mixing honey, glycerine and lemon juice in equal quantities and giving one to two teaspoonfuls as required.

Abdominal conditions.—The old household term "stomach cough" still holds good, though we need not be quite so precise as to the exact location of the source of irritation. Almost any form of intestinal irritation, flatulence, worms or even congestion of the liver will provide the necessary stimulus.

A cause frequently overlooked and yet exceedingly common is *wax in the ear.*

Finally, the cough may be of nervous origin or the result of habit.

Preliminary remarks on respiratory diseases.

A short description of the actual processes of the various diseases to be discussed will render the subsequent section more intelligible. In bronchitis, the lining of the air tubes is inflamed and the amount of mucus naturally secreted is greatly increased. Such mucus may cause embarrassment to respiration by its quantity or by its viscidity, it may cling to the walls of the tubes and seriously obstruct the passage of air. The air passing up and down the tubes, by displacing the mucus, gives rise to the rattling and wheezing heard or felt. The inflammation may be confined to the larger tubes, when it is not of great importance, or it may invade the finer tubes, a more serious matter giving rise to symptoms sometimes with difficulty distinguished from pneumonia.

In pneumonia the inflammation is of the lung, rendering portions solid and functionless.

Lastly, the inflammation may be of or spread to the lining membrane between the lungs and the chest wall resulting in pleurisy.

BRONCHITIS.

Bronchitis is perhaps the most common of all diseases in children and, in childhood, has certain peculiarities. The outstanding feature of the disorder is that it arises in connection with so many diseases, as if the bronchial tubes were, in the very young, the most sensitive part of the body. Not only does bronchitis become manifest as an early sign in many of the acute fevers, especially measles, whooping-cough and typhoid fever or as a serious complication later in the disease, but there appears to be a definite sympathy between the bronchi and the intestinal tract, so that in gastro-intestinal disorder of any gravity there will almost always be bronchitis. *Per contra*, where there is severe bronchitis there will be digestive disturbance, in fact it is by no means always easy to decide which of the two is the primary disease.

Again, bronchitis is peculiarly liable to arise during teething and here also is frequently associated with digestive disturbance.

The connection between *bronchitis* and *rickets* must be stressed as frequent recurrence of this disease should prompt an enquiry as to the possibility of rickets in an unobtrusive form. Finally, bronchitis may spread from catarrh of the upper air-passages, nose or throat.

It may be regarded as an axiom that once the child has suffered from severe inflammation of the respiratory tract, he has become more susceptible to further attacks and must be treated accordingly.

The *symptoms* of bronchitis may be of all degrees of severity, either so mild that the only manifestations are loose cough, slight wheezing and some small rise of temperature and of the rate of breathing or they may be of extreme severity. In the more severe type of case the fever is high, 102° to 104°F., the respiration is rapid, the lips are blue and there is every sign of distress. The child is restless, sleep is broken by breathlessness and cough. Repeated efforts to get rid of the sticky mucus may consummate in vomiting, which brings, relief. In the most severe cases, when the inflammation has invaded the finer tubes, the symptoms may resemble broncho-pneumonia, which will be described later.

Treatment.—The child is put to bed in a warm room. For this, as for all diseases of the chest, a plentiful supply of fresh air is essential, though the child should not be exposed to draughts. In the early stages, or when the cough is hard and the sputum sticky, recourse may be had to the steam kettle containing Friar's balsam one teaspoonful to one pint of boiling water. The kettle should be employed for about ten minutes at a time and should not be used when the air is already saturated with moisture as in the rainy season.

An expectorant mixture containing creosote is given, such as No. 20, or when the sputum is very sticky, No. 19 will help to loosen it.

One of the most potent remedial measures is external, that is, the rubbing of the chest night and morning with a stimulating liniment such as the mixture of olive oil and turpentine liniment No. 38. For older children, mustard oil may be used. Occasionally it may happen that the breathing becomes laboured and the lividity increases from the difficulty of dislodging the sticky mucus from the upper air passages. In such cases the strength of the expectorant mixture should be doubled and vomiting may be induced by tickling the throat with a feather. Emetics are not recommended as they are uncertain in their action and liable to cause collapse.

Special attention must be paid to the digestive system. As has been said above, the exciting cause of the bronchitis may lie in the digestive tract and no medication will avail unless the digestive disorder is corrected. Any distension of the stomach or flatulence is likely to cause further embarrassment to the

breathing; the diet, therefore, must be light and nourishing while the regularity of the action of the bowels is ensured.

CHRONIC BRONCHITIS is, in children, commonly secondary to some general constitutional weakness or disorder such as rickets. There are those children with a particular predisposition who suffer from bronchitis every winter. In other cases, the factor responsible is enlargement of the tonsils and adenoids leading to mouth breathing. Other cases follow an acute attack, but rarely persist for long. Others again depend on digestive disturbance or overfeeding, particularly with carbohydrate; the fat bronchitic baby is often cured by the reduction and readjustment of the diet. Others again, with the abdomen distended with flatus and the face blue with bronchitis, may be relieved within a few hours by the dispersal of the distension.

Chronic bronchitis is not infrequently persistent and obstinate after whooping-cough and measles. Remembering the susceptibility to tuberculosis after these diseases, the greatest care must be taken.

Though the symptoms are often trivial, consisting it may be only of a tendency to wheeziness, cough and shortness of breath on exertion, *the disease is a matter of importance for two reasons* :—The first, that if the disease persists, there is grave liability to serious and permanent damage to the air tubes and lungs; the second, that it may be the sign of some important underlying cause, notably rickets. Repeated attacks of bronchitis in young children, especially if of sudden onset, accompanied by much wheezing and of abrupt cessation, should give rise to the suspicion of asthma (*vide* Chapter XIX).

The treatment of chronic bronchitis is directed as much to the general health as to the local condition. Tonics especially cod-liver oil are indicated and for those children who are attacked each winter, a change of climate during the period of susceptibility is desirable. The most valuable local treatment is counter-irritation by rubbing the chest with stimulating liniments. The tonsils and adenoids, if enlarged, are removed, and any constitutional disease, such as rickets, is treated actively.

PLEURISY.

Pleurisy is a not uncommon disease in infancy and childhood. It is commonly secondary to inflammatory disease of the lung, pneumonia or tuberculosis or it may follow an attack of measles or scarlet fever. Again, the disease may be part of some general infection, rheumatism or blood poisoning or may arise as the result of chill or injury to the chest.

In the first stage, known as dry pleurisy, the surfaces of the membrane are roughened and give rise to pain and limitation of the movements of the chest wall. In the second stage, there is pleural effusion, fluid is poured out which separates the roughened inflamed surfaces and the pain is lessened, though there may be increasing difficulty in breathing. There is, in childhood, an increased tendency for pleural effusion to become purulent, especially if arising in the course of or after acute pneumonia. Such cases will call for prompt surgical intervention.

PNEUMONIA.

There are two main forms of pneumonia known respectively as broncho-pneumonia and lobar pneumonia of which the former is the more common in infancy and early childhood. For the sake of simplicity and brevity the two types will, after a short explanation of the main differences, be described together.

Lobar pneumonia has commonly an abrupt onset, the fever rises to 103°F. or more within a few hours and has no remissions; the course of the disease is from four to nine days. The degree of dyspnœa in relation to the prostration is not so great as in broncho-pneumonia. The disease usually arises independently of other disease. Broncho-pneumonia, the familiar form in infancy, is more commonly insidious in onset, either as an ingravescence of acute bronchitis or in the course of some debilitating disease, particularly severe bowel infection or as a complication of one of the acute infectious diseases of childhood, especially measles or whooping-cough.

When the onset is abrupt, the disease may be ushered in by vomiting or convulsions; when more insidious, these symptoms are absent, but there is evidence of gradually increasing want of oxygenation of the blood, that is to say, the lips and face become blue (cyanosis), the child is anxious and sleepless, and the breathing becomes panting (dyspnœa).

As may be expected, it is from the character of the breathing that we get our first pointer as to the diagnosis; the rate is increased to a striking degree, to 60 or 70 a minute or even higher, there is a perceptible pause at the height of inspiration followed by a grunt as expiration begins and the nostrils are widely dilated with each indrawn breath. The breathing is essentially laboured, all those muscles which normally take no part in the process of breathing are called into play. The pulse rate is approximately double that of the respiration. There should be no difficulty in distinguishing the difficult breathing of pneumonia from that of croup, the grunting expiration of the

former bears no resemblance to the crowing inspiratory stridor of the latter.

Cough is an inconstant symptom, it may be slight or racking and painful. The *sputum of infants and young children is not expelled, except by vomiting.*

Prostration is progressive; in favourable cases the pulse is strong and bounding, but as the disease advances, the pressure falls and dangerous collapse becomes imminent.

The tongue is furred and in the more severe cases becomes dry and brown as also do the teeth. The condition of the mouth is a valuable guide as to the general condition; so long as the tongue and teeth remain moist, the outlook is favourable. Most important are the abdominal symptoms, in the early stages persistent and severe abdominal pain may lead to an error of diagnosis. In all severe cases there is evidence of interruption of the digestive functions; there may be vomiting and diarrhœa. Abdominal distension (tympanites) is a common and grave complication and demands instant attention (*see* below). The movements of the diaphragm are limited to such a degree as to put large areas of lung out of action, resulting in further embarrassment to the respiration and an increased tendency to the spread of inflammation.

The fever is high, 103° to 105°F. In typical lobar pneumonia the temperature falls by crisis, that is, an abrupt descent to normal or below normal within a few hours, with amelioration of the general symptoms, though examination of the chest would reveal no change in the condition of the lungs.

In broncho-pneumonia the temperature does not remain at the same high level, it is subject to variations and remissions and descends to normal gradually.

The course of lobar pneumonia is from four to nine days, that of broncho-pneumonia longer, from two to three weeks. Both may be prolonged by the development of what is termed *creeping pneumonia,* in which a fresh patch of inflammation develops as soon as the earlier ones subside. Should the course of the disease be prolonged over a month, suspicion will be aroused that we are dealing with a case of tuberculous broncho-pneumonia.

Treatment.—The two main essentials of treatment *are good nursing and fresh air.* The child must be subjected to no undue fatigue, physical or mental, as every ounce of strength may be required to fight the disease to a successful issue. Bedding and pillows will be arranged so that the child is as comfortable as possible, the nurse may find that breathing is easier when the child lies on one particular side and this side should be favoured.

Young children should not be left in the same position for long lest the lung become congested or collapsed.

An abundant supply of fresh air is obviously necessary when the child is already struggling for breath and experience has taught us the importance of this point. The room, however, should be warm and the bed placed secure from draughts. Poultices or the application of antiphlogistine to the chest will be of value when there is pain and will doubtless help to loosen the phlegm, but the chest should not be swathed in thick heavy layers which hinder respiration and may drive up the temperature.

The diet is a matter of the greatest importance as the digestion is impaired and there is a tendency to dilatation of the stomach. For the very young, or for the severe case, peptonised milk to which some malted food has been added, according to the age of the child, is suitable. Meat jellies or beef tea make an appetising interlude, but their nutritive value is low. When the patient is still at the breast and unable to suck owing to shortness of breath, the breast milk is drawn off, diluted with about one-third its volume of boiled water and given with a spoon. It need hardly be said that adequate nourishment is all-important, but feeding must not be pushed to the degree to cause dilatation of the stomach. All meals should be small and given three-hourly. Medicines should be given immediately before or after food so that the child is not continually disturbed.

Of medicines, an expectorant such as No. 17 may be given or the following mixture :—Creosoti minim ¼, tincture alii minims 5, tincture benzoini co. minims 2½, vini ipecacuanhæ minims 2½, syrup of tolu minims 10, glycerine minims 10, water to two drachms. Dose, two drachms four-hourly to a child of one to two years. Tincture alii has a strong taste, but as a rule children take it well. Where there is great objection, this item may be omitted from the mixture. Further, in broncho-pneumonia the value of atropine cannot be overestimated. Where the breathing is laboured and there is much wheezing an injection of from 1/800th to 1/300th grain according to age will afford a very notable relief.

The most important and most common complication in small children is abdominal distension and a constant watch must be kept for this condition. Treatment consists of simple small enemata, the application of turpentine stupes to the abdomen and a No. 12 catheter should be passed into the rectum and left *in situ* for half an hour in every four. When this treatment is of no avail, intramuscular injections of pituitrin, two minims every two hours will be necessary. As a preventive measure the

bowels must be kept open daily with small doses of milk of magnesia assisted by olive oil and glycerine enemata.

Oxygen is of the greatest assistance when the child is blue or distressed and will do much to prevent the exhaustion consequent on the struggle for breath. The gas should be led from the cylinder through a flask of warm water and administered from ten to fifteen minutes at a time.

The treatment of sleeplessness presents something of a problem. On the one hand all hypnotics are depressant to some degree and on the other continued sleeplessness will produce rapid prostration. Efforts are first made to encourage sleep by simple means, warm sponging, use of the steam kettle when the cough is troublesome, hot drinks, oxygen or a little brandy. Failing these we must have recurrence to hypnotics, of which the bromides are the safest and most suitable (*see* No. 24 and No. 25).

Stimulants will in the more severe cases be called for early. Tincture of ephedra is perhaps the most valuable of all stimulants in acute febrile disease. The dose is proportionate to the age, taking one drachm six-hourly as the dose for an adult. It is well to administer this as soon as the case shows signs of gravity. When the pulse is very weak, adrenalin, minims one to three, may be given as a hypodermic injection and when the breathing is shallow strychnine grain 1/240th, combined with atropine, grain 1/500th four-hourly, for a child of 2 years, is administered. Brandy five drops in a teaspoonful of water is of use not only as a stimulant but also as a carminative. Digitalis on account of its slow and uncertain action is of little value and, for the purposes of slowing a rapid heart, strophanthone by injection is more practical. We have found that strophanthone (P. D. & Co.) injected hypodermically has acted beneficially. The dose for the adult is 1 c.c. and for the child in proportion to the weight, thus to a child weighing twenty pounds we should give 1/6th of the adult dose, taking one hundred and twenty pounds as the weight to which a full dose may be given.

If the temperature rises above 104°F. or persists at that level for long, it should be controlled by sponging and cold to the head (*see* Chapter XXI).

During convalescence a liberal diet is allowed, tonics administered and, if possible, the child sent to the sea-side. Care must be taken that every vestige of the lung disease has cleared up.

CHAPTER XIX.

BREATHLESSNESS.

In the previous two chapters we have discussed certain acute diseases of which shortness of breath is a prominent feature. It now remains to deal with certain of the more chronic or recurrent causes of this condition.

A distinction may be made between habitual breathlessness, persistent or provoked only by exertion and recurrent or intermittent forms.

Habitual shortness of breath.—The condition is commonly due to some *chronic disease of the lungs,* it may be simple chronic bronchitis, or it may be due to some more serious and less remediable disease. Unfortunately, the respiratory apparatus of children is susceptible to severe and permanent damage, left either as a legacy by some acute disease, or produced by some less acute disorder acting over a prolonged period. The bronchial tubes may be dilated (bronchiectasis), the lung itself may be over-stretched resulting in a loss of functioning tissue (emphysema) or inflammation of a chronic type may surround the tubes and spread into the lung (interstitial pneumonia). This last type of inflammation is prone to start from the glands at the root of the lung, especially after whooping-cough, if recovery is partial or prolonged. The above possibilities are stressed to emphasise the importance of treating respiratory disease till all traces are eradicated.

The second class of case depends on some *disability of the heart,* either inborn or acquired.

The term, *congenital heart disease,* is applied to those cases of developmental error, whereby the heart fails to acquire the power of maintaining an adequate circulation of blood throughout the body. Such cases are of all degree ranging from a slight disability unnoticed till the child reaches the age of active exercise, to those which are incompatible with life. The outstanding signs of the disease are the constant blueness of the lips or face and the breathlessness. In other forms, stunted growth, pallor and delayed progress are the more prominent signs. Such signs, especially if associated with a failure to thrive, should arouse suspicion and call for skilled investigation.

Of *acquired heart disease,* that due to rheumatic infection, is by far the most common. This disease, which plays havoc among

the children of the poor in the larger English towns, and is by no means rare in India, may develop at any time in childhood after the second year. As will be explained in Chapter XXII the onset of rheumatic infection is often stealthy and the symptoms are misinterpreted. The diagnosis will lie with the physician, but the mother should realise that when the child is unduly breathless and especially if pallid after mild exertion, the fault may possibly lie with the heart.

Special mention has been made of the heart as affected by diphtheria (Chapter XXV), but it may be stated that *after fevers, especially, perhaps, after influenza and whooping-cough, there is a tendency to temporary weakness of the heart muscle.* Such weakness will be made manifest by languor, pallor, breathlessness and exhaustion after exercise, signs that indicate the necessity for prolonged rest.

As a matter of fact, these warnings are to a certain extent unnecessary, as the mother will seldom fail to notice such adverse signs. On the contrary, the tendency is to suspect heart disease where none is, and in particular, two abnormalities are liable to give rise to this fear.

The first is sinus arrhythmia. In this condition the pulse is irregular, but the irregularity has no significance, and there are certain points by which it can be distinguished from irregularity due to heart disease. The irregularity is regular, the pulse rate is quickened during inspiration and slowed during expiration. The child is in no way hampered, and the pulse becomes regular after exercise, to reassume the irregularity after rest.

The *second type* is that of the young rapidly-growing boy or girl who becomes breathless on exertion, is subject to fainting fits in moments of stress and complains of palpitation. Such a condition naturally gives rise to fear of heart disease, but on examination, the heart is found to be normal. The condition is one of want of tone, partly nervous and partly of the heart muscle. Many of these cases are due to a low sugar content of the blood (*see* also Chapter XIII), and may be improved by the addition of easily digested carbohydrates to the diet. A cup of Horlick's malted milk with a stick of barley sugar in the middle of the morning may make an astonishing change in the child. It is important to remember that the "sugar shortage" produces such marked effects, so marked indeed that the suspicion of heart disease may be aroused,

Finally, it must not be forgotten that *breathlessness may be due to anæmia.*

PAROXYSMAL BREATHLESSNESS.

Of this type, often of such extreme degree as to cause anxiety or danger, we may mention :—

Obstruction in the throat—Foreign Body (*see* Chapter XXVIII), Croup (*see* Chapter XIV).

Obstruction in the chest—Asthma.

Abdominal distension.

ASTHMA.

Asthma is essentially a disease of childhood. About a third of all cases arise before the subject has reached the age of ten and in many the disease may be traced back to infancy.

"Like all the diseases of childhood, in which nervous influences play a large part, it is more frequently met with amongst boys than amongst girls (Hutchinson)".

The subject of the causation of asthma is a complex one. It would appear that there is a definite predisposition in which heredity or familial tendency plays a large part. Not infrequently more than one member of a family, including the parents and their relations, suffer from asthma or from some other disease, notably migraine which has a basic nervous foundation.

Added to the predisposition there is the immediate stimulus; it may be purely nervous, overexcitement or overfatigue, it may be the overdistension of the stomach, or the child may be what is known as sensitive to some substance, either swallowed, inhaled or produced by bacterial infection within the body. The particular substance or substances to which the child is sensitive will on being introduced into the body, give rise to a train of symptoms, which may take the form of asthma, hay fever, gastro-intestinal disorder, urticaria or even eczema, according to the reaction of the child.

The range of variety of such substances is wide, they may be protein foodstuffs, animal or vegetable, such as milk, white of egg, fish, oats or barley. Of those inhaled, the most common are the emanations of animals, horses, dogs or cats, feathers or pollen. Bacterial toxins are usually produced by some chronic infection of the bronchial tubes or post-nasal space.

The sensitiveness may be inborn or it may be acquired, the child being sensitised by some acute illness.

Some children are subjects of recurrent acetonæmia and suffer from asthma with each attack. According to Cameron these cases are worse when the blood sugar is lowest and are delayed or prevented by so adjusting the diet that the blood sugar level is well maintained.

Bray has shown that 75 per cent. of the subjects of asthma in children have deficient hydrochloric acid in the stomach, an important point in treatment.

An attack of asthma in the young child is frequently mistaken for acute bronchitis and the true identity of the disease is not suspected till the attacks have recurred many times. The catarrhal symptoms are intense, but the asthmatic nature of the attack will be suggested by the following points :—

The sudden onset, the development of bronchitic symptoms during but not before the attack, the markedly laboured and prolonged expiration and the persistence of signs of bronchitis for some days after the paroxysm has subsided.

The attack usually begins at night, the child wakes with a dry cough which is quickly followed by increasing difficulty in breathing. He is unable to lie down, his sensations are those of suffocation and he is positively fighting for breath. The face becomes blue or dusky, the eyes starting, but there is none of the stridor or crowing associated with croup. The attack lasts for an hour or more, and passes off leaving the child exhausted and with signs of bronchitis which persist for a day or two. Sometimes the attack is more severe and the suffocative state with increasing bronchitis persists for two or three days.

There can be no denying the fact that to be born with an asthmatic tendency is a great misfortune, though many children grow out of it. There is not as a rule any immediate danger from the attack, though in the very young convulsions may be excited, and cases of heart failure have been recorded. The gravity of the disease in childhood lies rather in the tendency to lead to permanent damage to the bronchial tubes and lung tissue.

Treatment.—The first desideratum is the relief of the attack. Of all immediate remedies, perhaps the most effective is the injection of adrenalin 1—1,000 solution hypodermically, minims 1 to 4 according to the age of the child.

Inhalations of fumes from burning powders containing stramonium are much in vogue, but they have the disadvantage that they are prone to increase the tendency to bronchitis. Inhalations of steam medicated with Friar's balsam or turpentine have not this disadvantage and will suit some children. In other cases, applications to the chest, poultices, fomentations or a rapid turpentine stupe, will bring relief.

Treatment also will be directed energetically towards the prevention of the attacks. It will be borne in mind that there are two factors in the production of asthma, the predisposing and

the exciting cause, each of which must be investigated and each of which demands a separate line of treatment.

The predisposition being nervous in origin and its manifestation being an easily excited spasm of the bronchial tubes, antispasmodics will be employed. Of these a mixture as follows will be the most generally useful :—Potassium bromide, grains 2; ephedrine sulphate, grain $\frac{1}{8}$; tinct. belladonna, minims 2; vin. ipecac., minims 3; syrupi simplicis, minims 10; water to 2 drachms. Dose suitable for a child of four. To be given six-hourly.

As a deficiency of gastric hydrochloric acid is so prevalent in these cases, it is well to try the effect of dilute hydrochloric acid, starting with three minims twice daily in water after food and increasing up.

The cases in which there is acetonæmia must be treated along the lines of this disorder, that is to say, a low fat and carbohydrate diet (*see* Chapter XIII).

The general hygiene of the patient must be carefully adjusted, special care being taken that he is not unduly "coddled" and converted into a chronic invalid. Except during the period of paroxysms or bronchitis, the routine should conform as nearly as possible to that of the normal child. Heavy meals at night and overfatigue should be avoided, constipation corrected, the diet carefully adjusted to requirements and digestive powers. Ample ventilation of the bed-room should be ensured. Enquiry should be made into the existence of any source of intestinal irritation, flatulence, dyspepsia or worms, or amœbic infection.

The question of the removal of enlarged tonsils and adenoids may arise, and while their removal may be recommended on grounds of general health, the result as regards the asthma is apt to be disappointing.

A change of climate may be sought, but it is difficult to foretell what locality will suit the individual. Speaking generally a dry climate at a somewhat high altitude is likely to prove beneficial.

With regard to food and other protein sensitiveness, investigation may be made in one of two ways. The commoner articles may be excluded from the diet in turn, the effect on the asthmatic attacks being observed, till, by a gradual process of elimination, the actual substance to which the child is sensitive is discovered.

Skin tests have been devised for the same purpose. These depend on the local reaction of the sensitive subject when the offending substance is inoculated on the scarified skin. Preparations of various substances, proteins and bacterial toxins are put

up in groups, ready for making the test. The group is first detected and finally the individual protein responsible.

Not infrequently assistance may be obtained from enquiry into the child's surroundings in relation to the attacks; it may be found that contact with horses, dogs or cats induces an attack, that removal of feather pillows from the bed may have a beneficial effect or that the attacks are seasonal, synchronising with the ripening of grasses and the production of pollen; in fact, when it is realised what a wide range of substances may furnish the exciting cause, it will be clear that considerable ingenuity may be exercised in tracing the actual offender.

It is always advisable to make a bacteriological examination of the sputum, and to prepare from it, if heavily infected, a vaccine.

BREATHLESSNESS DUE TO ABDOMINAL DISTENSION.

Acute breathlessness with cyanosis of the face is not infrequently seen in young children the subject of flatulent distension and constipation. The movement of the diaphragm is so hampered by the pressure within the abdomen, that a large part of the respiratory apparatus is thrown out of action. The following case will serve as an illustration:—

A child of two months artificially fed with excessive carbohydrate diet was brought to the hospital on account of cough. The cough was persistent and almost continuous, the breathing rapid and shallow, the face blue. On examination, it was found that there was a severe bronchitis with no air entry into the lower part of the lungs, the action of the diaphragm was reversed, and the abdomen was distended and tense. The child was given an emetic followed by a dose of castor oil with the result that next day all urgent symptoms had subsided and the bronchitis had, to a large extent, cleared.

CHAPTER XX.

RICKETS AND SCURVY.

RICKETS is a disease which is by no means uncommon in India though gross bony deformities, which are generally regarded as the essential sign of the disease, are not often seen. The conception is prevalent that rickets is mainly a disease of the bones. This is incorrect. The outward signs of bony change mark an advanced stage of the disease only, the earlier signs must be sought equally in the soft tissues. The age of onset is usually about one year, though signs may be found as early as but not before the sixth month.

The fundamental error in rickets is, broadly speaking, the inability to absorb and retain a sufficient quantity of calcium or phosphorus in the tissues. These salts are present in adequate quantities in the correct diet of the child, but are not absorbed and utilised unless the supply of vitamin D is sufficient, or if the demand for vitamin D is raised beyond the supply by inclusion of excessive starchy foods in the diet.

The effect of the want of these mineral salts is felt throughout the body tissues and is manifest not only in the poor or distorted growth of the skeleton, but also in the laxity of the muscles, the instability of the nervous system and a general tendency to catarrh and anæmia.

The *signs* which first attract attention will be one of the following :—

(1) Excessive perspiration especially of the head during sleep, associated with this may be marked restlessness during sleep with the habit of throwing off the bed clothes.

(2) Persistent delay of the normal physical attainments such as sitting up or standing. The child, even at a year old, may appear so weak in the back and manifest such obvious discomfort on being sat up, that suspicions may be aroused of serious spinal disease.

(3) Delay and disorder in the cutting of the teeth. Bronchitis or severe cold attend the eruption of each tooth. Occasionally attacks of croup, twitching or convulsions demonstrate the instability of the nervous system.

(4) A tendency to recurrent diarrhœa alternating with constipation and a distended abdomen.

(5) Irregular low fever.

On *physical examination* we find one or more of the cardinal signs :—

(1) Anæmia as evidenced by the pale skin and lack of colour in the lips and tongue.

(2) A large distended abdomen with a small ill-developed back.

(3) Lack of tone in the muscles and ligaments so that the limbs are weak and the joints have a radius of movement beyond the normal. This want of tone in the muscles and ligaments is responsible for the flat foot so frequently seen in young children.

(4) The liver and spleen are sometimes enlarged.

(5) Bony signs. The head shows what is known as frontal and parietal bossing that is to say, thickening and prominence of the bone at the four corners of the somewhat square head. The closure of the fontanelle (the soft spot at the top of the head) is delayed beyond the usual eighteen months and the aperture may be actually larger than normal. The ricketty rosary is the result of enlargement of the junction of the ribs and cartilages and is felt as a vertical row of nodules lying obliquely and external to the breast bone. The ends of the long bones, particularly at the wrists, are enlarged. Disturbance of the growth of these bones is revealed by X-ray examination before any outward change can be detected. The shape of the chest is altered and there may be an oblique groove on either side caused by the sucking in of the softened ribs during respiration and the pushing out of the lower ribs by the distended abdomen. Dentition is almost always delayed and the teeth are apt to come in the wrong order and come one by one instead of in pairs as usual.

Enlargement of the tonsils and adenoids is frequently present and these interfere with the free entry of air into the bases of the lungs and so tend to cause the typical chest deformity frequently seen in children about the age of three. Moreover, as a secondary result of these growths, colds and bronchitis are prevalent.

In the later stages, if treatment has not been undertaken, the bony deformities are very marked indeed, leading to permanent disability, but in modern times this should never occur.

The *immediate factors governing the production of rickets* are as follows :—

(1) The mother.

(*a*) Ill health and especially anæmia during pregnancy and nursing; a diet deficient in mineral salts and vitamins.

(*b*) Fresh air and sunshine are all important and without them the milk of the mother is likely to be deficient in vitamin D (the anti-rachitic or ricket preventing vitamin).

(*c*) Prolonged breast feeding is another potent factor, particularly among the poorer class who feed one baby right through a second pregnancy and then continue feeding both the new and the older baby.

(2) The child.

(*a*) Incorrect artificial feeding, especially in the direction of excessive carbohydrate food at an early age.

(*b*) Want of vitamins in the food (*see* Chapter V).

(*c*) Bad general hygiene, especially as regards fresh air and sunshine. The general immunity from gross bony rickets in this country may be attributed to the fact that as soon as children can walk they spend the most of the day in the sun and thereby the fats in the skin are converted to the anti-rachitic vitamin.

Prevention. Rickets should be regarded as a preventable disease though it must be admitted that cases do occur in spite of the most correct regime and are then due to inherent errors in the constitution. Apart from these rare exceptions, the disease may be avoided by attention to hygiene and to the principles of feeding (*see* Chapters IV, V and VI). In India especially where all milk must be boiled or use made of powdered milks, special care must be taken that any vitamin deficiency is supplemented by the addition of cod-liver oil or some concentrated preparation of vitamins to the diet. Mention has been made of the importance of fresh air, sunshine and exercise.

Treatment has of late years been simplified and improved by the addition of two forms of therapeutic agents :—(1) The concentrated vitamins and (2) the ultra-violet lamp.

Evidences of impaired digestion, a dirty tongue, capricious appetite, irregular action of the bowels or distended abdomen will not infrequently be found. Such conditions may be improved by giving rhubarb and grey powder (No. 11) or rhubarb mixture (No. 13). The specific mixtures mentioned below cannot be added until the digestion is normal. This specific remedy is cod-liver oil, in doses of three to four drachms daily, or Haliverol, 15 to 20 drops daily. These cannot be taken unless the child will tolerate them and he is unlikely to do so in the hot weather or when the digestion is markedly impaired. When this is the case we have recurrence to the concentrated vitamins such as Radiostoleum or Adexolin from which the bulk of the fat has been removed, and with such agents we have excellent results.

Occasionally we meet with patients whose digestions will not tolerate even these preparations and such cases should be taken to the hills.

Sunshine and ultra-violet rays. The action of sunshine is curative, but owing to the heat delicate children do not stand long exposures well. We have, in the ultra-violet ray an efficient substitute and this agent when available should be employed.

Mineral salts. It is of course essential that an adequate supply should be maintained. A well balanced diet containing the correct proportions of milk will ensure a sufficiency of calcium. Vegetable broth will make up for any deficiency, but in India where the mineral content of the food in general is apt to be low it may be well to add calcium and phosphorus in suitable forms for the diet.

For the anæmia we give iron, *see* prescriptions No. 28 or No. 30, to which may be added liver extract or liver and spinach soup twice a week. Finally, should the case have gone so far that there are actual bony deformities, special measures are necessary. These consist of massage and the application of corrective splints to the limbs, the child, at the same time, being prevented from standing or walking. If the back is weak he should not stand nor sit for long and the nurse should be warned not to carry him always on the same arm lest lateral deformities develop.

Chest deformities tend to improve as the child grows older and the process may be accelerated by breathing exercises and will be retarded if adenoids and tonsils are allowed to persist.

For flat feet appropriate boots may be worn and, after the acute stage is passed, much benefit will be derived from tip-toe and skipping exercises. It need hardly be stated that professional advice is essential in the treatment of such conditions.

INFANTILE SCURVY.

Infantile scurvy is a disease almost entirely confined to artificially-fed infants and is due to want of vitamin C in the food. The disease arises when the vitamins are destroyed in the milk by over prolonged pasteurisation or boiling and when the necessary quota of fresh fruit juice is not supplied. It may become manifest by sudden spontaneous bleeding under the skin or in the gums. Alternatively, the first sign may be that the child screams on being lifted and appears unwilling or unable to use the limbs. Immobility may be so marked that the suspicion of paralysis may be raised. Moreover, owing to the acute tenderness, the child may even scream when the cot is touched or

slightly shaken. The condition is due to hæmorrhage under the membranes covering the bones or sometimes at the junction of the ribs with their cartilages.

The diagnosis is not difficult; we may see purplish swellings in such situations as the eyeball or our suspicions with regard to the painful limb may be confirmed by examining the gums which may show patches of purplish swelling and, finally, in almost all cases there is some blood in the urine. It is sometimes incorrectly assumed that the child is suffering from acute rheumatism, but as the disease occurs most commonly between the sixth and eighteenth month of life true rheumatism may be definitely excluded and further visible evidences of hæmorrhage as mentioned above will be detected. Under appropriate treatment the condition may be expected to clear up within a few days. If possible fresh raw milk should be given and one half ounce of orange or tomato juice three times a day or a teaspoonful of mango juice every two hours. If these are not procurable a potato should be baked in its skin and the immediate portion near the skin rubbed up with enough milk to give it the consistency of cream (Still). Give two teaspoonfuls three times a day. Young carrots also may be employed in this manner. Further sources of vitamin C will be found in Appendix III.

CHAPTER XXI.

ON GENERAL DIAGNOSIS AND TREATMENT OF FEVER.

The general term fever implies a raising of the body temperature above the normal with certain symptoms which become more marked as the temperature rises. These are a dry skin, flushed face, thirst, restlessness, quickened pulse and usually an increase in the size of the pupils.

The normal temperature is somewhat higher in the child than in the adult, but a temperature of above 99°F. should be regarded as slight fever. There is a slight daily variation, the evening temperature in health being slightly higher than that of the morning.

The temperature of the infant may be taken in the groin or the rectum, the rectal temperature will be at least half a degree higher than the groin temperature.

The thermometer reading in the rectum or mouth is the only safe guide as the skin temperature varies considerably in relation to the internal or true body temperature.

It is well to remember that temperatures persistently or markedly below normal, subnormal temperatures, call for investigation just as much as do high temperatures.

The causes of fever are manifold and it is the almost universal first reaction to disease, especially in children. At the same time it should be borne in mind that the temperature in infancy is extremely unstable and that comparatively small matters, nervousness, overexcitement, a slight cold, or constipation may give rise to quite marked, but usually transient fever.

In the first stages of many diseases, fever and its attendant symptoms may be the only manifestations, and there is nothing to enable us to make an exact diagnosis. Bearing the difficulty in mind we must follow some definite system of investigation. The principles laid down in Chapter X are followed and some local signs such as a sore inflamed throat, wheezing in the chest or alteration in the character of the stools may afford a guide as to the identity of the disease. We take into account events preceding the onset of the fever such as a capricious appetite, an exposure to infection, or the biting of mosquitoes. Our investigations may fail to yield any clue and we then consider such pointers as are offered.

1. *Nature of onset.* (*a*) Abrupt. Malaria, influenza, the acute infectious fevers of childhood, especially measles, *B. coli* infection. In infants the shivering attack characteristic of the onset of fever is often replaced by a convulsion (*see* Chapter XIV). In *B. coli* infection on the contrary shivering is usual, even in infants. Fever accompanied by rapid pulse suggests malaria; accompanied by a slow pulse, influenza, dengue or disorders of the liver. (*b*) Onset slow with daily increase of maximum temperature, typhoid fever, digestive disturbances.

2. *Course of fever.* Gradual rise of maximum temperature with but slight daily remission, little or no perspiration, increasing drowsiness, increasing furred tongue, typhoid fever. If accompanied with rapidly enlarging spleen, kala-azar. Fever markedly irregular with abrupt drops, perspiration accompanies falling temperature, vomiting accompanies rising temperature sometimes complete intermission, with temperature rising on alternate days, malaria; high maximum temperature of short duration daily with abrupt drops, relatively little constitutional disturbance when the temperature is low, *B. coli* infection. Irregular fever with disproportionately rapid pulse and abrupt changes in the pulse rate suggest rheumatic infection.

It need hardly be said that in all cases of doubt the blood should be examined for malarial parasites and the urine for pus cells. Recurrent bouts of fever are apt to be looked on as malarial but are often of digestive origin, *see* Chapter XI. They may also be due to tonsillar sepsis or recurrence of *B. coli* infection. Prolonged fever of low degree 99° to 100°F.—investigate the teeth, tonsils and ears. Finally, in certain circumstances prolonged and high fever somewhat resembling typhoid may be caused by roundworms.

Though sometimes a diagnosis cannot be made, without awaiting the course of events, much can be done to alleviate discomfort and influence the subsequent course of the disease. This being so, it is desirable to formulate some principles on which treatment should be conducted.

During fever, there is an unnaturally rapid breaking down of the body material, with a wasteful production of heat. While the destructive processes are accelerated, the building-up processes, which should normally more than balance the loss, are to a great extent suspended. The appetite is impaired and the digestion less active than in health. While it is not desirable to enter here too deeply into the chemical processes of the body during fever, certain facts should be appreciated as they form a foundation on which rational treatment can be based. Firstly, the exaggerated breaking down of body substance leads to an extra accumulation

of waste products, which must be disposed of by the kidneys, liver and bowels. Secondly, there is an alteration of the normal chemical processes and these processes are of special importance in relation to diet. The body calls on its reserves and they are burnt up at a more rapid rate than they can be replaced. Firstly, the store of sugar within the body is reduced, then follows the breaking down of fat at a rapid rate, but this process is incomplete in the absence of sufficient sugar, and poisonous bodies are formed. With an accumulation of the *poisonous bodies*, known as ketones, in the blood, there is an extra call on the mineral salts of the body for the neutralisation, so that there follows a shortage leading to signs of an unbalanced nervous system, restlessness, twitchings, convulsions and possible delirium. The logical deductions from these facts are, firstly, that *the sugar reserve must be built up, secondly, that the fat in the diet must be kept low, and thirdly, that the mineral salts must be replaced.* At the same time, these chemical changes are not the only ones at work. The brain and spinal cord are particularly susceptible to the action of heat, a fact which is borne out by the tendency to delirium, sleeplessness or convulsions in high fever, so that the actual temperature itself, if excessive, constitutes a danger and calls for control.

Finally, there is to be considered the effect on the body of the poison produced by the particular disease, which may require special treatment.

Whatever the cause of the fever, the above statement of the case holds good and, according to such principles, treatment must be conducted.

Fever and hyperpyrexia.

Some degree of fever is inseparable from most diseases and except as part of the disease, constitutes no danger. At the same time if *the temperature rises above a certain point, the degree of heat in itself becomes a danger.* The danger depends to a great extent on the duration of the illness. In typhoid fever, for example, we attempt to keep the temperature not higher than 103°F., because it may persist for days or weeks at that height, but in more transient fevers, such as malaria, such a temperature calls for watchfulness, but not active interference; the danger point would here be 104°F. except in infants or when there are warnings of nervous irritability. *The temperature of the atmosphere materially affects the temperature of the febrile patient* once it is over 102°F., so that in hot weather, the point for interference should be taken as at a point lower than in cold weather and a rising temperature of 103°F. would call for

sponging. A condition in which the temperature rises over 104°F. is spoken of as hyperpyrexia.

Cold to the head.—It is undesirable to keep an ice-bag continuously in contact with the head of a young child or infant as the intense cold may depress the nervous system. The ice-bag should be moved over the head gently at intervals and thus it may be applied for five minutes or so, and repeated after an interval. Perhaps the most satisfactory way is to suspend the ice-bag near enough to the head to exert a cooling effect.

The thickly folded wet cloth, which is so commonly applied, is really an additional source of heat, it soon becomes warm and acts like a poultice. A single piece of muslin, wetted at intervals with an evaporating lotion, should be used. A convenient ice-bag can be obtained from the chemist.

Drugs.—There are certain drugs which have the property of reducing the temperature in many cases, but their action is not always desirable and their use should be subject to the advice of a medical adviser. One of the methods detailed above is safer and often effective where drugs fail.

Various methods for the reduction of temperature are at our disposal, the most effective having for their principle the removal of heat by the application of cold.

Tepid or cold sponging is the treatment of election when the rising temperature is encountered early and has not reached a degree such as to constitute a menace: thus in the course of typhoid fever, if the temperature is not more than 103°F., but is rising, tepid sponging will reduce the temperature and, if skilfully carried out, will prove soothing. Sponging may be employed to soothe a restless patient and often induces sleep.

There are, however, cases which resist such mild measures and there are those, with a temperature of 105°F. and over, which demand treatment which is likely to produce a more immediate effect and in which it is only increasing the danger to delay. For such cases *it is absolutely necessary to resort to the bath* and in the case of infants and young children, this should, if possible, be given by the mother or someone else with whom the child is familiar. The child is to be immersed in tepid or cold water and this is to be done in such a manner as to avoid all unnecessary shock or fright. For this reason it is better that the cold bath, if judged by the height of the fever to be necessary, should start as a tepid bath and cold water gradually added.

The younger the child the warmer should be the starting point and infants should not be subjected to the completely cold bath. It is often desirable to start the bath at a temperature of about 95°F.

After about ten minutes, the child is removed, placed on a sheet or large towel and gently dried without rubbing. The skin should be left a little moist. He should then be replaced in bed covered by a light sheet.

During the time in the bath, the most careful watch should be kept for shivering, change of colour either pallor or blueness. Such signs call for immediate removal from the bath and the taking of the patient's temperature by the rectum. Pallor or blueness should be treated with stimulants.

During and after the bath, the temperature taken under the arm or in the groin is valueless as a guide, the groin temperature may be 100°F. when the true temperature as taken by the rectum is 105°F. It is *not desirable to attempt to bring the temperature below* 102°F.; if the impression is gained that the child is cooling rapidly, he should be removed from the bath and the temperature taken. A rapid drop from a high temperature is a sign that the bath should be discontinued.

After the bath, the child's temperature should be taken every twenty minutes for the next hour so that we may be forewarned against another rise or too rapid a drop. The first will call for a repetition of the bath, the second for stimulants and warmth. Of course, if the child is sleeeping peacefully, he may be left alone.

The COLD WET PACK has, for the child patient, no advantage over the bath, but may be used in continuation of the bath when the temperature obstinately rises after immersion. The method of administration is simple; a sheet wrung out in cold or tepid water is spread over the patient stripped of all clothing and replaced by another as soon as it gets dry or hot.

The ICE-CRADLE is an apparatus constructed for the purpose of keeping the patient surrounded by a cool atmosphere. It will be found invaluable in the treatment of typhoid fever cases during the hot weather. When the standard apparatus is not available, a substitute may be erected with the aid of a large fracture cradle or bamboo cage inside which are hung ice-bags, the whole being covered by a blanket.

While the body of a fever patient is dry and burning hot, it is courting disaster to heap on the bed clothes in the hope of inducing perspiration and it is possible to convert a mild fever into a dangerous fever by such methods. Once the shivering stage has passed, the clothing should be light. When perspiration begins naturally about the roots of the hair, the forehead and at the bends of the joints, additional clothing may be drawn over the patient.

The fevered child craves for cold drinks and this craving may be gratified provided that the quantities at any one time are not too great. Cold or iced drinks are valuable in more ways than one, the heat of the body is to a certain extent neutralised, the thirst is quenched and the child is encouraged to drink the large quantities of fluid so essential in the fevered state. Plain water, orange or lemon water and barley water may be given.

Rest and sleep are essential, the child in severe illness may require every ounce of strength to survive and none of this strength must be wasted by unnecessary exertion either of the body or mind, neither must the patient be subjected to the fatigue of too rigorous nursing. The most complete rest is, of course, sleep and sleep must be encouraged by such simple methods as warm sponging and it may be necessary to have recourse to sedative drugs of which the most suitable are potassium bromide or chloral.

The thorough VENTILATION of the sick-room is essential because (*a*) the body is kept cooler, (*b*) an ample supply of fresh air is necessary to supply oxygen to the disordered blood, (*c*) fresh air diminishes the liability to complications affecting the lungs.

THE MANAGEMENT OF DIET during the period of sickness and in convalescence calls for the greatest care and judgment on the part of all concerned in the welfare of the child and much depends on the skill with which the appetite is tempted by dainty and varied preparation of the necessarily limited articles. The diet must be simple, it must be acceptable *and above all, it must be sufficient.*

The tradition still persists, unfortunately, that milk is the only diet for the sick child, yet the child, with the instinctive dislike which sick children have for fatty foods, comes to loathe it. Milk, however, does form a sound basis for the diet, but for the reasons explained above should be skimmed and well balanced by easily digested carbohydrate food.

There is a natural tendency to fear any form of solid food, but it may be remembered that light solid food, such as biscuits or well prepared invalid puddings, become, in the stomach, at least as fluid as does milk.

Unless definitely indicated by the minute quantities the child is able to take, food should not be given more than three-hourly; too frequent feeding allows no time for the digestion to recuperate, and is irksome to the patient and so may react unfavourably on the appetite.

It is quite impossible to lay down a system of diet which will cover every illness and every degree of illness, individual

circumstances must dictate, but the following lists may be taken as a general guide.

For the very gravely ill child.

Skimmed milk, predigested if necessary. Whey.

White of egg in the form of albumin water.

Malted foods. Mellin's food. Horlick's malted milk. Benger's food made with skimmed milk.

Brand's essence. Chicken or beef tea. These contain very little nourishment, but are of value as mild stimulants and appetisers.

Glucose (grape sugar) or glucose D, perhaps the most easily absorbed form of nourishment or raisin tea.

Jellies.

For the less gravely ill child.

Other articles or other treatment of the same articles is permissible.

Toast, plain biscuits or rusks (will assist in keeping the mouth clean).

Soufflés variously flavoured.

Junket or milk jelly.

Sago—cornflour or oatmeal jelly.

Vegetable soup.

Fruit jellies.

Pounded fish.

Stimulants are often necessary in the course of a prolonged fever when there is evidence of great weakness or prostration. A condition of extreme prostration, known as the " typhoid state ", presents a picture somewhat as follows. The patient lies semi-conscious and indifferent to his surroundings, there is low muttering delirium, the tongue is brown and dry, the lips and teeth are dry and covered with dried brown secretion, the pulse is weak and rapid, there is pallor or greyness of the sunken face, and the hands wander aimlessly and pluck at the bed clothes. This condition is extreme and we should aim at prevention by the timely administration of suitable stimulants before such a state is reached.

First among stimulants must be mentioned *glucose*. It is not a stimulant in the ordinary sense, but it is a food which is absorbed rapidly and increases the power of the heart. Glucose should be included in the diet of all patients suffering from severe fever.

Of the stimulants in the accepted sense of the term, the most valuable is alcohol, in the form of good and preferably old, brandy. For an infant 5 to 10 drops in a teaspoonful of water

is a suitable dose. An infant of 1 year old may take up to ¼ ounce in the twenty-four hours, diluted 1 to 20, and a child of four, double that amount. How far such stimulation is to be continued will be decided by the effect, a clearer intellect, a stronger pulse and greater tranquillity will be taken as signs of improvement.

In the case of young children, the use of alcohol should be discontinued as soon as possible, as there is a risk of seriously damaging the liver by prolonged use.

There are other forms of stimulants, pure drug stimulants with no food value, as for example, strychnine, adrenalin, and camphor (the last named is somewhat uncertain in its action owing to slow absorption, and no infant should ever be allowed to inhale camphor). Such drugs are likely to be necessary in the course of certain diseases, but they will be administered only under medical advice.

Reference will be found under various headings to the use of tincture of ephedra, a most valuable heart stimulant. The author has used it in hundreds of cases of severe febrile disease and is satisfied that the influence of this drug has saved many lives. Finally, in cases of grave exhaustion, use may be made of intravenous injections of 25 per cent. glucose solution, dose according to estimated weight, averaging 10 c.c. for a child of eight.

TREATMENT OF OTHER SYMPTOMS ASSOCIATED WITH FEVER.

Headache.

Cold to the head.
Bromide draught.
Aspirin (caution is necessary in the case of young children).
Attention to the action of the bowels.

Vomiting.

Sucking ice.
Sodium bicarbonate grains 10 to 60.
Mustard plaster for from 5 to 10 minutes over the stomach.
Reduction or abstinence from diet for some hours, water only given.
Injections of atropine, dose grain 1/800th to 1/300th according to age. This drug will also be found invaluable in hiccough or persistent nausea.

Diarrhœa.

Diarrhœa should always be regarded as serious. For treatment, the reader is referred to the special chapter on the subject.

Delirium.

Delirium in the early stages of an illness is usually due to high fever and calls for treatment as detailed under hyperpyrexia. In the absence of high fever, delirium indicates exhaustion and calls for stimulation. In the low muttering delirium, which is so often seen in prolonged fevers such as typhoid, the daily injection of ½ to 1 c.c. of colloidal calcium will do much to maintain the mental balance. At the same time, stimulants rather than sedatives are demanded, but if there is marked restlessness, or the child appears mentally agitated or is tossing about, bromides, as in prescriptions 24 or 25, must be employed.

Subnormal temperatures.

Subnormal temperatures of 97°F. or lower are the natural sequence of high temperatures; in the case of transient fevers, the condition may last for a few hours only, but after a prolonged fever, the temperature may remain subnormal for days and is a sign of lowered vitality. The pulse should be of normal rate or lower; if accelerated, it is a sign of weakness of the heart.

Temperatures of 96°F. or below should suggest collapse and call for stimulants, warmth, absolute rest and the most careful feeding.

Low temperatures in infants without previous illness should prompt a thorough investigation of the health, diet and general hygiene.

CHAPTER XXII.

RHEUMATIC FEVER AND RHEUMATIC INFECTION IN CHILDREN.

The grave importance of rheumatic fever or infection lies in the tendency of the disease to produce serious permanent or even fatal disease of the heart. Of late years it has been realised that the disease is common in India especially in the more humid climate of the East and South. During the last five years, two hundred and thirty patients suffering from rheumatic heart disease have been admitted to the Medical College Hospital, Calcutta.

Rheumatic fever is a disease characterised by fever, swelling, pain and tenderness of the joints, with a tendency for the swelling to flit from one joint to another, profuse acid sweats, a sore throat and symptoms of heart disease in varying degrees. This disease, of abrupt onset and marked symptoms, is the disease of older children and young adults, but attacks less commonly young children.

In children under twelve years of age rheumatic infection is insidious, the symptoms which would suggest rheumatism are often slight, but yet, unchecked these apparently trivial and disconnected symptoms may culminate in heart disease as surely as if the child had been stricken with the most virulent form of rheumatic fever. Indeed, rheumatic disease of the heart may develop without any appreciable signs of joint disease, or the heart may be the primary point of the attack and the joints affected months or even years after.

In early childhood, acute swelling and tenderness of the joints is a rarity, rather is the tenderness in the muscles of the limbs. There are aching pains which are often regarded carelessly and called growing pains, or there may be stiff neck, pain in the hip or at the back of the knee. Such pains should not lightly be disregarded, they should prompt a careful consideration of the child's state of health, examination of the heart and an enquiry into the existence of other signs and symptoms which would suggest the disease. The more common signs are occasional sore throat, occasional bouts of fever, a tendency to anæmia, lassitude and rapid exhaustion after mild exercise. These symptoms, trivial though they may appear, are associated often with progressive and severe disease of the heart. In fact,

in some cases the first symptoms noted are related to the heart. The *diagnosis*, therefore, is difficult and our main points will be as follows :—

The recurrent attacks of fever, with or without fleeting pain in the limbs. The characteristic of this fever is that the pulse rate is rapid and does not fall necessarily with the temperature and also that the rate varies considerably from time to time. Recurrent tonsillitis, a tendency it may be to headache and pain in the abdomen and a progressive anæmia.

The subjects of this disease are as a rule of the nervous type, they are highly strung, they are spare, and their intelligence is good. They are mentally and bodily active at the time of the invasion but at this period the picture may change and lassitude may take the place of superabundant energy. Of greatest importance in the diagnosis is the family history, as rheumatism is very definitely a familial disease and we seldom fail on close enquiry to find evidence of rheumatism in some closely related member of the family. It is clearly of the greatest importance that the presence of this disease should be realised as all our efforts must be directed to the prevention of serious and permanent damage to the heart.

With the adolescent type of rheumatism the picture is different. There is high fever, often of abrupt onset and almost invariably accompanied by a sore throat. There is pain and swelling of the larger joints, particularly of the knees, ankles and wrists. The characteristic of this pain and swelling is that it flits from one joint to another. There are frequent acid sweats. In such cases we must be constantly on the look out for the development of disease of the heart. This, as in the infantile type, is more likely in the first place to take the form of muscular rather than valvular disease. The pulse increases in rapidity, the heart becomes somewhat dilated and the first sound short and faint with a tendency to fœtal rhythm. Later the dilatation may reach such a degree as to produce relative mitral incompetence.

The age incidence will be of some assistance in forming a conclusion; rheumatic infection is unknown in the first year of life, is very rare in the second year, and as has been said above, the joint symptoms are slight or absent in young children. The diagnosis of rheumatism in a case of acutely swollen joints in a young child must be made with caution, bearing in mind the other more common causes of acute joint inflammation, infantile scurvy, acute epiphysitis or osteomyelitis.

Rheumatic nodules are small raised lumps beneath the skin, most commonly found on the back of the forearm just

below the elbow, but often in other situations where bone or tendon is near the skin; at the back of the head, round the knee and over the shin and ankle. In size, the nodules vary from that of a pea to a walnut, the skin is not inflamed and there is a remarkable absence of tenderness. Though nodules are not present in every case, when present they are of extreme importance both in the assessment of the gravity of the case and in determining whether the disease is active. A number of nodules, or the appearance of a succession of crops, is to be regarded not merely as an indication of active rheumatism, but of severe infection. These nodules are exceedingly rare in Indian children. Three cases only have come under the observation of the writer and with all three severe heart disease was associated.

Apart from sweat rashes, to which the rheumatic child is particularly prone, the most characteristic rash is a pink raised eruption, tending to form overlapping rings. The rash does not itch, fades and recurs at intervals.

Treatment.—The child is kept in bed between blankets wearing a flannel nightgown. The swollen joints are protected with cotton-wool and light bandaging.

In salicylate of soda we have a drug with a specific action on the joint symptoms and fever of rheumatism. How far this drug is a value in rheumatic heart disease is uncertain, but it is probable that even if it has no curative value, it may control the infection and so prevent further damage.

During an acute attack it is desirable to administer this drug in doses of a size which would, unguarded, produce symptoms of poisoning, but in the presence of sodium bicarbonate, these doses may be given without fear of toxic effects. It should be the rule that every dose of sodium salicylate should be given with at least double its quantity of sodium bicarbonate. Dr. Lees has shown that if sufficient sodium bicarbonate be administered to keep the urine alkaline, there is no danger of symptoms of poisoning even with large doses of salicylate. For a child of ten after a preliminary mild aperient, grains 20 may be given two- to three-hourly up to five doses and then at longer intervals. If there is depression and nausea, the doses should be lessened. It is, however, preferable to start with lower doses, to test individual tolerance and if there is no nausea, to increase rapidly. The writer has given up to grains 160 daily without provoking untoward symptoms.

After the subsidence of fever and joint swellings, ten grains should be given three times a day for two or three weeks. During treatment constant watch should be kept for signs of heart affection. Should such signs become apparent, the need

for prolonged rest in bed, it may be for months, is imperative. In the presence of less acute manifestations, there is not the same need for such large doses of salicylates, but the drug should be continued over long periods.

Great care is required when there is evidence of definite heart damage and in the more chronic type of case, often without arthritis (joint inflammation), the decision as to whether the disease is active is fraught with difficulty and rests largely on the character of the heart sounds, the degree of dilatation, and the rapidity of the pulse. Further, there are two signs of the utmost importance, firstly anæmia, which is progressive so long as the disease is active and, secondly, loss of weight. Children suffering from chronic rheumatic infection are invariably thin. The treatment of such cases is disappointing; it is doubtful if sodium salicylate has any specific effect on the lesions in the heart, but it should be continued at least so long as there is fever or pain.

Iron and arsenic or liver extract and iron are used with advantage to combat the anæmia. Rest must be prolonged, even for months, until the pulse rate remains normal and later, increasing activities must be checked by their effect on the pulse rate.

During convalescence special attention should be paid to hygiene and prevention of relapses. The child should be warmly clad, should avoid damp and, if possible, be removed to a warm dry climate. He should be carefully guarded from overfatigue and mental excitement or worry. Iron tonics and cod-liver oil should be given. It must be remembered that *this disease is peculiarly liable to relapse*, so that precautions must be taken throughout the whole period of childhood.

If the tonsils are the seat of recurrent inflammation, they should be removed after the active disease has subsided.

CHOREA.

This disease is not uncommon amongst European or Anglo-Indian children, especially in hill schools, but one case only of an Indian child has come under the notice of the writer.

The frequency with which signs of rheumatism are associated, either concurrently or consecutively, the common appearance of rheumatic nodules in chorea, and the identical result on the heart, lead to the conclusion that rheumatism and chorea are indeed different manifestations of the same disease.

The onset of chorea is often attributed to some fright or shock and it is probable that this is merely the final deciding factor to the already susceptible child.

The earliest symptoms are attributable to weakness and want of control of the muscles, the child drops things, falls about,

there is mental deterioration, he makes no progress at school, is inattentive and forgetful.

Later, purposeless fidgeting movements and grimaces are noted which may become violent and continuous, the gait is affected and the speech may become irregular and jerky. The movements involve all muscles, face, limbs and body, no two successive movements are alike, respiration may become uneven owing to sudden contractions of the trunk muscles. The movements are exaggerated under stress of excitement or observation, but except in the most severe cases cease absolutely during sleep. In the more severe cases there is loss of power in the limbs amounting to paralysis, and there may even be complete, though temporary, loss of speech. Associated with the above-mentioned symptoms, there is change in the mental state, the child becomes first inattentive and forgetful, later emotional and excitable.

On examination, after a general survey, two signs are looked for, the patient is asked to put out his tongue and hold out his hands in front of him. The tongue and limbs show the jerky movements common to the other muscles, but the diagnostic points are, firstly, that the tongue is jerked suddenly and violently in and, secondly, that the hands assume a characteristic position with the wrists slightly bent and the fingers overextended, a position which cannot be imitated by the hand of a normal person.

Treatment.—Rest in bed is the first essential, until the more violent movements have ceased. The child must be prevented from hurting himself by the violent movements and it may be necessary to protect the joints with padding. In an uncomplicated case, the duration of this rest will be from three to four weeks, but in the presence of signs of rheumatism, or if heart disease develops, the child must be confined to bed for two to three months or more. During this time, the diet must be simple but adequate, as the constant movements are a tax on the reserve and the strength must be built up.

Of the drugs employed in the treatment of chorea, arsenic is of proved value. Starting with a dose of 2 minims of liquor arsenicalis in a wineglassful of water three times a day after meals, the amount is increased drop by drop up to five minims. Watch is kept for signs of intolerance, sore eyes, nausea and vomiting, diarrhœa and skin rashes. After ten days the drug is discontinued for a week and then a further course given. The writer has found calcium lactate grains 30 per day of marked value.

In the presence of signs of rheumatism, salicylates are given as detailed above.

When the movements are violent or the child is excitable or sleepless, some form of sedative, of which chloral is the most satisfactory, is given. The dose is fixed according to the demands of the case, starting with grains 5 to a child of eight.

During convalescence, iron especially is indicated as a tonic. At the same time much judgment is required in the regulation of the child's activities. On the one hand, overexcitement or fatigue may provoke a recurrence, on the other, some process of re-education will be required for the child to regain complete control of the limbs and acquire emotional balance.

CHAPTER XXIII.

TYPHOID FEVER (SYN. ENTERIC FEVER).

Typhoid fever is a continued fever of from 21 to 42 days duration, more commonly the latter in India. Up to the age of two the symptoms are identical with those of severe gastro-intestinal catarrh and the true identity of the disease can only be discovered by laboratory methods, though the remarkable drowsiness may be suggestive. From the ages of two till ten the more typical typhoid fever of children is seen. There is little tendency to severe hæmorrhage and the occurrence of perforation is exceptional but, on the contrary, the nervous symptoms are well marked and there is a constant menace from lung complications. A happy feature of this disease in the young, however, is the singular capacity for recovery even in the most desperate cases.

Infection is introduced by the mouth in food or water which has been in some way contaminated with germs discharged from a patient. Flies play a prominent part in this contamination. The discharges of the patient, urine and motions are swarming with bacilli. They may remain infective, that is, they may contain living bacilli for months or even years after recovery but this is unusual. Persons thus discharging living or virulent bacilli are known as carriers and play an important part in the spread of the disease. Many cases have been contracted through the domestic staff, one of whom has been a carrier.

The period of invasion is from 1 to 3 weeks; during the latter part of the incubation period the patient may exhibit some lassitude and loss of appetite.

The onset is, as a rule, insidious, the child is slightly feverish, complains of headache and is apathetic. There is a gradual increase in the intensity of the symptoms and a step-like progress upwards of the temperature with slight morning remissions, reaching 103° to 104°F. about the end of a week. On the contrary, the onset may be abrupt and the true " typhoid condition " reached rapidly.

At the end of the first week the temperature has reached a high level which is likely to be maintained for ten days or more. At this stage a rash, in the form of scattered rose-pink spots on the abdomen may appear, but is not usual.

The disease is now fully developed. The tongue is thickly furred, white with a tendency to brown, red at the tip and edges.

There is cough and slight bronchitis, and this may become so severe as to obscure the other features of the disease. Pneumonia may develop. The abdomen is puffy, there is usually some gurgling and the skin over this area feels hotter to the touch than that of the rest of the body. If the case progresses satisfactorily the puffiness does not increase, but in the more severe types there is serious distension which reacts unfavourably on the lung condition. The bowels are seldom regular, there is either constipation or diarrhœa with greenish-yellow offensive motions.

Nervous system. The child is apathetic and drowsy or complains of severe headache. There is a tendency to delirium of a low type at night. In the more serious cases the child is practically unconscious or there is meningismus, a condition resembling meningitis but of favourable outlook (*see* Chapter XXVII).

The pulse tends to be slow in proportion to the temperature in the early stages, but becomes more rapid if exhaustion advances or the heart is affected.

After a period varying from 14 to 30 days the temperature chart changes type, there are more marked daily remissions and the general trend is towards normal. At the same time amelioration of the general condition is to be expected. There is, however, not infrequently a disappointing tendency to a persistent evening rise for some days. The cause of this is not always clear, but in many cases it is due to urinary infection.

Relapses are by no means rare and usually start within a week or ten days after the subsidence of the first attack. The course of the relapse resembles the initial attack, but is usually milder and shorter.

Complications.—As stated above, the two most dreaded complications, hæmorrhage and perforation, are exceedingly rare under the age of ten and danger is to be feared rather from broncho-pneumonia, exhaustion or heart failure. Abdominal distension, also, is frequent and liable to prove disastrous as it interferes with proper nutrition and increases the tendency to broncho-pneumonia.

The *diagnosis* is; as a rule, not difficult after the lapse of a few days. Commencing in the same way as other fevers, immediate recognition is not possible, but certain distinguishing characteristics will develop :—Early languor and drowsiness, steadily rising temperature, the relatively slow pulse to the temperature, abdominal distension, increasingly furred tongue, marked heat over the abdomen and bronchitis.

The diagnosis may be hastened by recourse to laboratory assistance. In the first week the bacteria may be cultivated from

the blood. After this they may be isolated from the stools or a blood test (Widal) carried out.

The diseases with which typhoid fever is most likely to be confounded are :—

(1) Bacterial infection of the urinary tract.
(2) Persistent diarrhœa of intestinal dyspepsia with fever.
(3) Miliary tuberculosis.
(4) Kala-azar in the early stages.
(5) Ascaris infection (roundworm).
(6) Malignant malaria.

THE TREATMENT OF TYPHOID FEVER.

In this disease nursing is all important, at least as important as medical treatment. The aim of the nurse should be to ensure absolute tranquillity, to guard the child against all exertion, bodily or mental, to encourage sleep, and to see that adequate diet is taken. Special attention must be paid to the prevention of bed sores and the care of the mouth, though all unnecessary movement in the performance of the toilet must be avoided.

There are four prime principles of treatment :—

1. The maintenance of nutrition.
2. The maintenance of adequate fluid intake.
3. Prevention of lung complications.
4. Prevention of abdominal distension.

1. Maintenance of nutrition. The ultimate success of the treatment of severe cases of typhoid fever depends on the maintenance of an adequate diet, but there are practical difficulties—loss of appetite, nausea, semi-consciousness with suppression of digestion and diarrhœa, which must be taken into consideration.

The constituents which are essential at this time are proteids and carbohydrates. The basis of the diet therefore is skimmed milk or whey with Mellin's food—glucose or glucose D. The milk may be peptonised if necessary—*dab* water or fruit juice may be added.

Feeding should be three-hourly except during sleep. It is quite out of the question to lay down hard and fast rules as to diet, each case must be judged on its merits, special points to be noted being the presence or absence of distension of the abdomen, diarrhœa or discomfort.

Beef tea and chicken soup make pleasant additions to the diet and stimulate the appetite, but contain little nourishment and are best avoided if there is diarrhœa.

When there is much gurgling, abdominal distension or diarrhœa, fully predigested skimmed milk should be used. It is

desirable to make, in all cases, a daily calculation of the caloric value of the diet as well as of the fluid actually taken.

In the later stages of prolonged cases, when there is malnutrition and anæmia we have administered liver extract in the form of Heparnovina with good results.

2. Maintenance of fluid. Dehydration (lack of body fluid) must be regarded as an impending danger in all cases. The child is seldom thirsty, is indifferent to all externals and semi-conscious, and the inadequacy of the fluid taken often passes unnoticed. The amount to be taken should be measured and if this falls below the necessary quantity, a rectal saline preferably by the drop method may be given. The amount aimed at should be proportionate to the estimated adult requirement of six pints a day. The true proof of sufficiency lies in the maintenance of a free flow of urine and a reasonable degree of moisture of the tongue. There is no objection to iced fluids; on the contrary they are pleasing to the patient and help to keep the temperature within moderate limits.

3. The prevention and treatment of lung complaints. Posture, nutrition and stimulation form the basis of treatment. Children should not be kept flat on the back, they should be allowed to lie on one side or the other and when the abdominal condition is acute, particularly when there is distension, they should be propped up.

4. Distension of the abdomen must be treated actively (*see* below) and when there is bronchitis, mild expectorants should be given.

Medicines. In general a mild alkaline fever mixture may be given, but the more potent antifebrile drugs should be avoided. We have had excellent results in those cases in which Bacte-intestophage has been given. Large doses of alkalis given with the intention of preventing acidosis are definitely harmful.

Towards the end of the third week hexamine may be given to prevent infection of the urinary tract, but is useless if the urine is alkaline. Euflavine capsules grain ½ may be given to older children and are effective in alkaline urine.

TREATMENT OF OTHER FEATURES AND COMPLICATIONS.

Constipation.—Avoid purgatives—endeavour to secure an action of the bowels every other day with soap enemata to which may be added 1 ounce of olive oil.

Diarrhœa.—Reduce the diet temporarily to whey or peptonised skimmed milk. If severe administer bismuth mixture No. 9.

Distension.—If severe the diet must be cut off entirely for twelve hours and water only given. Turpentine stupes are applied to the abdomen and a simple enema administered. Should the condition persist or increase, as it may do, being due to muscular weakness of the bowel, pituitrin, minims 1 to 3 according to age, is administered two-hourly to four doses. At the same time a flatus tube is passed (for young children a No. 12 catheter) and left in position for 20 minutes every four hours.

High fever—see *Chapter XXI; Sleeplessness*—see *Chapter XXI; Delirium*—see *Chapter XXI.*

Exhaustion and weakness of the heart as evidenced by an increasing pulse rate and weak heart sounds call for stimulation. The most suitable are tinct. ephedra and adrenalin (*see* Chapter XXI). The pulse rate may increase to such a degree as to necessitate the injection of strophanthone. The injection of glucose intravenously, 10 c.c. of 25 per cent. solution for a child of 8, is of the utmost value in such cases, the heart failure being due in many cases to lowered blood sugar rather than the effect of toxins. The dose may be repeated daily till the stage of exhaustion is passed.

Hæmorrhage.—

(*a*) Absolute rest. No movement of any kind.
(*b*) Morphia injection. Dose according to age. *See Chapter XXXIII.*
(*c*) Ice-bag suspended from a cradle over the abdomen.
(*d*) Injection intramuscular of calcium chloride grain 1 in 1-100 solution or colloidal calcium 1 c.c.
(*e*) Injection intramuscular of 2 c.c. hæmoplastin.
(*f*) Do not give stimulants.
(*g*) Ice or iced water to drink as necessary, but the less that is taken the better.

Perforation.—The signs of this catastrophe are sudden pain, collapse with a fall in temperature and accelerated pulse rate and increasing rigidity of the abdomen. The only hope of saving the patient lies in prompt surgical operation.

The presence of ascaris infection increases the danger of perforation, for this reason the stools should be examined for ova and if necessary, at a period when the stools are loose, santonin without purgative administered.

Finally, it may be found at the end of the disease that there is a persistent rise of evening temperature. Often this is due to infection of the urine, but in some cases no evidence of this can be discovered and in such cases small doses of quinine will be effective.

PREVENTION.

Every child above four years should be inoculated against the disease (*see* Chapter IX).

In the sick room, special precautions are desirable to prevent the spread of the disease.

(1) All excreta of the patient should be treated with strong lysol.

(2) The vessels and utensils used by the patient should be kept separate and not allowed to leave the sick room. They should be washed in water to which sufficient potassium permanganate has been added to turn the water bright pink.

(3) All bed clothing after use by the patient should be steeped in disinfectant, carbolic or perchloride of mercury.

(4) Flies must be rigidly excluded from the room.

(5) The attendants should exercise special care after handling the patient. In the sick room they should wear a long coat or gown which must be changed before they sit down to a meal. The hands should be thoroughly washed in some such disinfectant as perchloride of mercury.

(6) In the interests of others it is desirable that the stools and urine of the patient after convalescence be examined bacteriologically for the presence of living bacteria. As has been said above, these organisms occasionally persist for a long time, and in their presence, special precautions must be observed.

PARATYPHOID A AND B.

These two fevers of the same group usually in the young patient run the same course as that of typhoid and are often indistinguishable from it save by laboratory tests. Some cases, however, run an extremely irregular course and the symptoms are prominently gastric. The treatment is on the same lines as that of typhoid fever.

CHAPTER XXIV.

FEVERS PECULIAR TO THE TROPICS.

MALARIA.

Malaria is a non-contagious fever of tropical and subtropical countries caused by a blood parasite which is injected into the human system during the process of biting by the Anopheles mosquito. The disease is most prevalent in those localities in which the mosquito breeds freely, that is, swampy or broken ground in which pools or stagnant water collect.

The part played by the Anopheles mosquito is that of definitive host. The mosquito, in sucking the blood of the infected person, takes up also the parasites. These, after a series of changes, are reinjected into the fresh subject bitten by the mosquito. It is therefore against the Anopheles mosquito that the first anti-malarial measures should be taken.

The principles of prevention of malaria are fully discussed in Chapter IX, it only remains to mention prophylactic quinine. In many districts it is the custom to issue regular doses of quinine as a preventive. The author is unable to recommend this measure as a routine; it must be emphasised that quinine is a poisonous drug, it destroys the digestive ferments, it is absorbed into the liver to the detriment of that organ, and, in general, acts adversely on the health of the child. At the same time it must be accepted that in highly malarious districts we are driven to the use of prophylactic quinine as a preventive against the otherwise inevitable infection.

In the typical attack three stages succeed each other. In the first, the cold stage, there is violent shivering, in the second or hot stage, the temperature rises rapidly and in the third stage, there is profuse perspiration with a decline of the temperature to normal. Such attacks, in the untreated subject, tend to recur at regular intervals.

The *symptoms* are less regular in the young child, the shivering stage may be absent, indeed in children under five it is unusual, but is not infrequently replaced by convulsions. Occasionally, but rarely, the attack subsides without sweating. The stages, generally, are of shorter duration than in the case of adults, though the hot stage is always well marked. The premonitory

symptoms are slight, often insufficient to attract attention; the child does not seem really ill, but is apathetic, yawns and refuses food.

In most cases it will be observed that the attack is preceded by an unusually copious flow of urine, though, after the fever is established, the urine is red and scanty. The attack or ague fit begins with a feeling of cold, the skin becomes pale, shrivelled and rough (goose-skin); the finger nails bluish. The skin feels cold, though even at this stage the thermometer may reveal a rise in temperature. Violent shivering may ensue, but it is rare in young children. The pulse rate is accelerated, usually before the temperature begins to rise.

Vomiting at this stage is often violent and may persist after the temperature has risen. This stage may last from a quarter of an hour to three hours to be replaced by the hot stage. Some two hours after the onset of fever, the temperature may rise to 104°F. or higher persisting for two hours or more. The decline down to normal or even below is rapid; according to the amount of perspiration, so will be the rate of cooling.

Malarial fever, if untreated, usually observes periodicity, returning more or less at the same hour every day or every other day, but is less likely to do so in children. In the variety known as subtertian fever there is sometimes no complete intermission of temperature for some days.

Two forms of malarial attack, which are induced by the subtertian (malignant) type of infection, deserve special attention. In the first, the algid form, there is intense vomiting and profuse watery diarrhœa, often with "rice-water" stools resembling those of cholera, and early collapse. The temperature is but slightly raised. In the second, the cerebral form, the patient becomes drowsy and finally comatose. Occasionally the coma is accompanied by actual paralysis of one or more limbs and the attacks then present a clinical picture identical with cerebral hæmorrhage. Such conditions demand the most urgent treatment. For the algid form the best treatment is the intravenous injection of normal saline solution to which is added the appropriate dose of quinine bi-hydrochloride. For the cerebral form the best treatment in childhood is by intramuscular injection (*see* below).

Later developments. Because the ordinary attack of malaria is not attended with consequences immediately serious, it is likely to meet with scant attention, with the result that the infection is not eradicated and recurrences take place frequently. Such recurrences will ultimately undermine seriously the health. The spleen is enlarged sometimes to such a degree as to occupy more

than half the abdomen; the liver is also enlarged and its functional activity impaired, there may even be jaundice. There is a progressive and serious degree of anæmia, loss of weight and impairment of growth. In short, a persistent deleterious influence everywhere pervades the body which may actually imperil the life of the child.

Diagnosis is not as a rule difficult but confirmation should be obtained from microscopic examination. There is no difficulty in extracting a drop of blood from the lobe of the ear or the finger and the discomfort is practically negligible. The blood should be taken before quinine is administered. Valuable information will be obtained not only as to diagnosis but also in regard to the intensity of the infection. If the parasite count is high we are warned that intensive treatment is urgently necessary.

If after full administration of quinine for three days the fever fails to yield, doubts should be entertained as to the diagnosis of malaria (unless confirmed by the finding of the parasites) and if after five days the fever persists, we may definitely exclude malaria.

Treatment.

At the onset of the cold stage, the child is well wrapped up and hot-water bottles are applied. As the fever rises, the coverings are gradually removed, so that they may not accentuate the rise. During the sweating stage, a blanket should be kept over the patient. Special attention should be paid to the height of the temperature in hot weather, and sponging or rapid bathing be employed if the fever rises above 104°F. (*see* Chapter XXI). On no account should a child with fever be left unattended at night. Water, barley water, orange or lemonade is given without stint, cold or iced.

From the onset of the hot stage an alkaline fever mixture, No. 21, is given; at this juncture the administration of quinine is likely to increase the discomfort and cause vomiting. As soon as free perspiration is established, the time for specific treatment, that is, the administration of quinine, arrives. The old rule of waiting till an hour or so before the next attack is due is a bad rule. The quinine then increases the nervous irritability and discomfort, while it reacts but slightly on the disease. Again, it is not good practice to withhold the quinine till the normal temperature is reached, indeed, in serious cases, the temperature will not fall till quinine in adequate doses has been administered, and it may be necessary to give it even at the height of fever or, when vomiting prevents retention, to have recourse to injection.

Quinine taken does not necessarily mean quinine acting; it must be absorbed and to facilitate absorption the bowels must be well opened. The purgative which is found the most efficient is calomel. A child of four years should receive half a grain followed four hours later by a saline purgative (No. 3). It is of the utmost importance that the bowels should be kept open freely during the administration of quinine.

The standard dosage of quinine is as follows :—

Age.	Dose.	Administration.
1 to 3 years ..	1 grain	Three times a day.
4 ,, ..	2 grains	,, ,, ,, ,,
5 to 6 ,, ..	3 ,,	,, ,, ,, ,,
7 to 10 ,, ..	4 ,,	,, ,, ,, ,,
11 to 15	5 ..	.. ..

These are maximum doses and should be diminished if the tolerance is poor, that is, if there is nausea, deafness or buzzing of the ear. No child under 10 should receive more than five grains in a single dose. Dose for injection, grains 2 to 5 according to age. For this purpose a neutral preparation such as Quinoform Lacroix is to be preferred as it is practically painless. The researches of Acton have shown that the action of quinine is augmented if moderate doses of alkali (sodium citrate or sodium bicarbonate) are given some twenty minutes earlier (grains 5 to a child of 1 to 4, grains 10 for 4 to 7), and that the optimum timing for administration is 2½ hours, not immediately after meals. In addition to intensifying the action, such timing has the advantage that the quinine does not inhibit the stomach digestion.

The dose should be continued thrice daily for 7 to 10 days. A course of iron and arsenic should follow this starting with minim ½ of Fowler's solution, well diluted, three times a day and increasing with caution. When the anæmia is severe a course of liver extract with iron is effective.

A repetition of the attack should be treated in the same way and great care should be taken to guard the subject against chills, overexcitement or overfatigue, all of which are liable to provoke an attack.

Quinine injections may be found necessary when persistent vomiting prevents the retention of quinine by the mouth, when the alimentary canal refuses to absorb and when the urgency of the case as in the algid or comatose form demands a more immediate exhibition of quinine in the system.

In case of great urgency (*see* above) the intravenous route of administration may be employed, but this is seldom desirable

in children. When this route is adopted quinine bi-hydrochloride may be used in a dilution of not less than 2 c.c. of normal saline solution to each grain.

Euquinine and aristochin are useful in the treatment of children as they are practically tasteless, but the doses employed must be considerably higher as the quinine content is lower.

Average doses of euquinine and aristochin (Chopra) :—

1 year	..	1½ grains	6-hourly	3 times a day.
3 to 5 years	..	5 „	„	„ „
5 to 10 „	..	7 „	„	„ „

Two synthetic preparations, Atebrin and Plasmoquin, have been introduced, which, while they cannot be regarded as superior to quinine in the treatment of children, may be employed with advantage in the case of those children who do not tolerate quinine and for the eradication of the parasite when the attack is passed.

Atebrin has an action similar to quinine and is effective in all forms of malaria, but will not rid the blood of the malignant tertian gametocytes (crescents). The course of treatment is five days and the fever may be expected to return to normal on the third day. Should the examination of the blood reveal the presence of crescents, the course of Atebrin must be followed by Plasmoquin, but the two should not be given simultaneously as the combination is toxic. The dosage is as follows (Chopra) :—

Age.		Dose.		Administration
Atebrin—				
1 to 4 years	..	0.05 gramme or	¾ grain.	Twice daily.
4 to 8 „	..	0.05 „ „	¾ „	Thrice „
Over 8 years	..	0.1. „ „	1½ grains.	Twice „
Plasmoquin—				
1 to 8 years	..	0.005 gramme		Twice daily.
Over 8 years	..	0.005 „		Thrice „
Over 12 years	..	0.01 „		Twice „

Course three days.

A child subject to recurrent attacks should be removed from the locality, if possible to the seaside or, failing this, a hill station at low elevation. Sudden transfer to a cold climate may precipitate a further crisis. It should be remembered that the patient is less tolerant to large doses of quinine in a cold than in a hot climate. Persistent malarial infection in the European child constitutes an urgent demand for transfer to Europe.

DENGUE.

Dengue is a disease appearing in extensive outbreaks during the hot weather and the rains. The disease is most prevalent in

the large seaport towns of the east, but has spread inland. It is transmitted by the bite of the small black and white "Tiger" mosquito (*Stegomyia fasciata* or *Aedes ægypti*).

The disease is characterised by acute pains in and around the joints, severe headache and backache with high fever, and the appearance at some stage of the disease, of a rose pink rash. It would appear that children are to some degree immune to this disease, or do not as a rule react in the typical manner to the infection.

The onset is usually of startling abruptness, with acute pain in the head, back and joints, shivering followed by the development of high fever (104° to 105°F.). There is some soreness of the throat, the eyes are injected and red, while the face appears swollen and flushed.

The child is apathetic and somnolent, but unable to sleep properly owing to the impossibility of finding a comfortable position. The pulse is often markedly slowed.

This state of affairs, with high fever and pain, persists for two or three days, when a somewhat abrupt alleviation takes place, the temperature drops, the pains diminish or disappear and recovery appears to be imminent. The disease has, however, not yet run its course. After an interval of 12 to 36 hours, the temperature again rises, there is a recurrence of symptoms, though not with the first intensity, and the fever persists as a rule for 24 hours only. The joint pains, which, in the adult patient, may persist for weeks after recovery, seldom do so in young children.

Examination of the site of severe pain may reveal some swelling of the structures round the joint, particularly in relation to the tendon sheaths, but there is no evidence of fluid within the joint. Tenderness also is rather of the tendons and muscles surrounding the joint, than of the joint itself.

One characteristic sign is the extreme tenderness of the muscles of the eye so that any movement causes pain.

At some time or other during the attack, or even after the fever has subsided, a rash, somewhat resembling measles in form but not in distribution, appears. It is scanty on the body and face, but the limbs may be smothered, especially the wrists and forearms. The rash, though common, is not a constant feature of the disease; in some cases it fails to appear; in others, especially mild cases, it may appear after all other symptoms have abated, while yet in others it may be superseded by urticaria (nettle rash).

In spite of variations, the disease is not, as a rule, difficult of recognition. The seasonal incidence, the pain and tenderness of the limbs and eyes, the absence of catarrhal symptoms and the slow pulse, are features which point to a diagnosis, which is confirmed if the typical rash appears.

The prospects are almost invariably favourable. The only danger is from the high fever, which may induce convulsions. Subsequent prostration, with persistent pains and stiffness in the joints so often marked in adults, is not common.

Treatment. The patient is confined to bed and rendered as comfortable as possible by the judicious arrangement of pillows. Special attention should be paid to the temperature of young children and efforts should be made to keep it within safe limits by recourse to the measures described in Chapter XXI. The bowels are regulated by saline aperients, the diet is light and ample fluid is allowed.

For the relief of pain, aspirin, given cautiously, combined with tincture of opium, ¼ to ½ minim for every year of the child's age, at six-hourly intervals, will afford some relief.

During convalescence a tonic such as No. 27 or No. 30 is desirable.

SUNSTROKE AND HEAT-STROKE.

True sunstroke, as distinct from heat-stroke is, in the opinion of the author, a rare accident, due rather to excessive action of sunlight on the eyes than to any excessive heat. The symptoms comprise of fever about 103°F. to 104°F., of variable duration, from two to ten days, with its attendant discomfort, and a most striking intolerance of light. The condition resembles somewhat that of cerebral irritation following head injury. The patient lies curled up, with head and eyes away from any source of light and is resentful of disturbance. Recovery is protracted and it may be weeks before the patient is able to tolerate the full light of day. It is to be remembered that such symptoms can be produced even in a cool atmosphere when the sun is strong and the head and eyes insufficiently shaded.

HEAT-STROKE, on the contrary, is a condition induced by excessive external heat independently of the sun's rays; it may occur at night or in well sheltered rooms. The sudden and intense fever is induced by a failure of the mechanism of heat exchange, whereby the body temperature is normally kept at a constant level. In hot weather the body is maintained at normal temperature, often below that of the surrounding air by sweat evaporation. If such evaporation is prevented or if the heat production of the body is increased beyond compensatory limits by over indulgence

in food, alcoholic drink or excessive muscular movements, the balance is upset, heat accumulates within the body and the temperature rises to a degree incompatible with life.

The *immediate causes* of heat-stroke are:—

1. High atmospheric temperature if the air contains moisture to a degree to prevent evaporation of sweat.
2. Excessive or tight clothing preventing evaporation and inducing heat retention.
3. Impairment of the mechanism, by cessation or diminution of sweating, such as occurs in most fevers.

In practice it is found that *many cases of heat-stroke* have *their origin in other fevers, especially malaria.* At a certain degree of fever, the heat control of the body is lost and if the temperature of the surrounding atmosphere is high, the body heat will tend to approach that temperature.

The *premonitory symptoms,* which should be taken as a sign for active treatment:—A rapidly rising temperature, a flushed or even purplish face, acute thirst, giddiness, faintness or confusion, suppression of perspiration and urine. If this stage is passed the patient lapses into unconsciousness, the eyes are fixed and red, the pupils contracted, the breathing rapid and deep, becoming after a time stertorous, that is to say, noisy and snoring. The heart may be observed to beat violently against the chest, the pulse is rapid and weak, the skin is dry and burning hot. Convulsions may or may not occur. The temperature, taken with the bulb of the thermometer one inch in the rectum, may register 107°F. to 108°F. or more. The onset of symptoms or the rise of temperature above 105°F. calls for urgent treatment with the object of reducing the temperature within safe limits. The methods to be used are described on p. 193.

Bearing in mind the frequency with which such cases are associated with malaria, a dose of quinine is given as soon as the patient can swallow, and better still, an injection.

At the stage of decline there is liability to severe collapse calling for stimulants in the form of alcohol, adrenalin, strychnine or caffeine. After the crisis is passed, the patient rests undisturbed in a cool place and is allowed to sleep.

Great care should be taken that the gradual approach of insensibility is not mistaken for sleep, but constant observations of the rectal temperature will prevent this error and at the same time, not disturb sleep. Any disposition to restlessness and excitability at this stage should be met by a dose of chloral followed by potassium bromide and cold to the head. As soon as possible a purgative should be administered, none being better than epsom

salts and senna, and the patient ordered moderate doses of quinine for a few days.

SANDFLY FEVER.

Sandfly fever is a disease of hot dry climates, prevalent in the Punjab, the North-West Frontier and other parts of India. The transmitting agent is the sandfly, *Phlebotomus papatasii*, a difficult pest with which to contend, as owing to its small size, it passes freely through the mosquito net or ordinary mesh. The duration of the disease is from three to seven days. The onset is sudden with severe frontal headache, pains in the eyes, back and limbs. There is prostration and drowsiness. In addition there is frequently severe pain in the upper part of the abdomen with a marked distaste for food. The tongue, clean at the edges and tip, is coated with a thin white fur.

The temperature reaches the maximum within twelve hours of onset, remains at the level, 102° to 103°F., for some twenty-hours and then gradually descends to normal.

Convalescence is apt to be prolonged by persistent debility, mental depression and dyspepsia.

The treatment is symptomatic and consists in attempts to alleviate the discomfort by the exhibition of salicylates, aspirin, and, if necessary, opium.

KALA-AZAR.

Kala-azar is a prolonged fever of an irregular remittent type, common in certain parts of India, notably Bengal and Assam.

The disease attacks persons of all ages and works considerable havoc where it is prevalent, but, so far, the number of cases among Europeans is comparatively small.

With improved diagnostic methods, it has been shown that many cases, hitherto regarded as chronic malaria, or malarial cachexia, are, in reality, kala-azar.

The disease is transmitted by the bite of a species of sandfly, *Phlebotomus argentipes*, and is caused by the presence of a parasite, *Leishmania donovani*, in the blood and internal organs, particularly the spleen.

The chief characteristics are :—

1. Prolonged fever, often of months' duration, with periods of intermission.

The fever is at first persistent, the chart resembling that of typhoid fever, for which this disease may be mistaken in the early stages. After two or three weeks the chart assumes a more characteristic form. There are daily remissions, seldom as low as the normal line and the apex of the daily rise is toothed, that

is to say, there is a double rise in the twenty-four hours. After some weeks there may be a period of apyrexia lasting two to three weeks, followed again by further periods of fever. The condition, if untreated, drags on for months, till the subject dies of exhaustion, anæmia, ascites, or debility opens the door to some more acute infection.

2. The spleen enlarges early and rapidly, more rapidly than in any other febrile condition, and attains such a size that the outline is almost visible on the surface, and the abdomen protrudes in marked contrast to the general emaciation of the patient.

3. The liver enlarges also, but in a later stage of the disease and there may be marked enlargement of the spleen before any enlargement of the liver is perceptible. In some young children the enlargement of the liver is more marked than that of the spleen.

4. The darkening or pigmentation of the face, from which the disease derives its name, " Black Fever ". The pigmentation is most marked on the temples, forehead and round the mouth.

5. Progressive anæmia, emaciation and exhaustion. The lips, the under side of the eyelids and the sides of the tongue lose their normal colour and finally become almost white. The patient is listless, weak and there is extreme loss of flesh and a tendency to bronchitis.

6. In the late stages of the disease dropsy, fluid in the abdomen (ascites) or jaundice may develop. If the white corpuscle count falls below 2,000 or the polymorphonuclear leucocytes below 1,000, there may be extensive sloughing within the mouth (cancrum oris). In the experience of the writer, this will not occur unless the red blood count is below two million.

During the first ten days or so after onset, the picture presented may be that of a mild attack of typhoid fever, but the slow development of symptoms, the rapid advance of the spleen and the absence of the typhoid bacilli on culture of the blood will assist in the diagnosis.

Further, when the duration of typhoid fever is prolonged beyond the customary period, the possibility that kala-azar has developed must be considered. Napier pointed out in 1922 that there is a definite connection between the two diseases and that the typhoid infection may light up a dormant kala-azar infection.

Kala-azar must also be distinguished from chronic malaria. In both cases the spleen and liver are enlarged, there are periods of irregular fever, there is profound emaciation and anæmia. The white blood count, however, will suggest a diagnosis, there being a much more marked reduction in kala-azar, the count falling as low as 2,000 cells per cubic millimetre.

The additional laboratory tests are :—

(*a*) Serum tests. Chopra's test and the formaldehyde test depend on a reaction developed in the blood serum. These tests are constant only when the disease has been in progress for some time, Chopra's test after 21 days, the formaldehyde test after three months.

(*b*) The *Leishmania donovani* parasite may be discovered in the blood of 60 per cent. of cases if at least four slides are examined, but as a negative test the procedure is not of much value.

(*c*) A blood culture can be relied upon to give a positive result in 99 per cent. of cases, but a culture sometimes takes three weeks to become positive.

(*d*) Spleen puncture to make a diagnosis is not a procedure which should be undertaken lightly by the inexperienced, though, performed by the expert, it is an easy, safe and rapid method of making a diagnosis.

Finally, if all other means of diagnosis fail, it is permissible to give a course of treatment; improvement may be expected after the third or fourth injection, but as reaction to treatment is sometimes delayed, it is desirable that, once we have embarked upon this course, the full course of treatment should be completed.

Treatment.

The treatment of kala-azar has been further developed by the substitution of certain organic compounds for the simple antimony salts. These compounds, urea stibamine, neostibosan and others, are less toxic than the simpler salts, consequently larger doses can be given with less danger of reaction.

Neostibosan has the advantage that it is given intramuscularly or intravenously. The usual doses are as follows :—

Infants and small children under 2 years, 1st dose 0.05 grm., later dose 0.1, total 0.9.

Children from 2 to 4, 1st dose 0.05 grm., later dose 0.2, total 1.2.

Children from 5 to 9, 1st dose 0.1 grm., later dose 0.2, total 1.8.

Children from 10 to 15, 1st dose 0.2 grm., later dose 0.3, total 2.8.

Adult, first dose 0.2 grm., later dose 0.5, total 3.7.

Injections to be given every other day.

Alternative treatment is urea stibamine intravenously and the doses are as follows :—

Age 7 to 12, 1st dose 0.025 grm., 2nd dose 0.05, 3rd dose 0.1, maximum dose to be repeated.

Age 5 to 7, 1st dose 0.025 grm., 2nd dose 0.05, no increase on second dose.

Age 1 to 4, 1st dose 0.0125 grm., 2nd dose 0.025, 3rd 0.05, second or third dose repeated according to susceptibility.

Age 6 months to 1 year, 1st dose 0.0125 grm., repeat three times, then 0.025.

Injections given bi-weekly, at least 10 required.

Cautions.

1. No advance in dosage is made if there is severe reaction as evidenced by hyperpyrexia, vomiting, nausea or diarrhœa.

2. If there is severe bronchitis or dysentery, the dosage must be regulated with the greatest caution.

We have found that in those cases of months' duration in which there is advanced anæmia, and particularly in those with cancrum oris, the addition to the treatment of liver extract injections with iron is of the utmost value. Furthermore, as many of the infected children are suffering from intestinal parasites, two or three stool examinations are made and if ova are found, the appropriate treatment is instituted, after the antimony treatment is completed.

In malarial districts the two diseases often coexist and it is consequently often advisable to give quinine treatment by the mouth for four days immediately following the course of antimony injections.

There are some cases which are remarkably resistant to treatment and in such cases treatment must be continued until a cure is obtained.

The criteria of cure are as follows :—

1. A cessation of all fever. 2. The subsidence of the spleen and liver to the normal size. 3. The restoration of the white cell count to the normal. 4. Definite increase in weight.

The red cell count may remain below normal till the prolonged courses of iron have been administered and serum tests, Chopra's and the formaldehyde, if strongly positive originally, do not become negative within three months.

CHAPTER XXV.

THE INFECTIOUS DISEASES OF CHILDHOOD.

Incubation and Quarantine Periods of Infectious Fevers.

	Incubation period.	Rash appears.	Rash fades.	Quarantine from latest exposure.	Period of infectivity.
Measles ..	7—18 days, usually 14 days.	4th day	5th—7th day.	From 7th—16th day.	Three weeks from appearance of rash.
German measles.	7—20 days, very variable.	2nd—4th day, often earliest symptom	4th—7th day.	7th — 22nd day.	Not less than 7 days from appearance of rash.
Mumps ..	10—22 days	...	...	22 days	Minimum three weeks, one week from disappearance of swelling.
Whooping-cough.	7—14 days	...	...	16 days	Four weeks from onset.
Chickenpox .	Average 12—14 days.	1st and following 3 days.	About 4th day.	18 days	Until every scab has fallen.
Smallpox ..	Average 12—14 days.	3rd—4th day.	9th — 10th day.	16 days or successful vaccination.	Until every scab has fallen.
Diphtheria	2—10 days, usually 2—4 days.	...	...	Depends on bacterial examination.	Depends on presence of organism.
Influenza ..	1—4 days	...	...	5 days	During persistence of morbid discharges.
Typhoid group.	5—23 days, usually 12 days.	8th—9th day.	21st day	..	Indefinite (according to persistence of bacteria).
Typhus ..	5—20 days, usually 14 days.	5th day	14th day	16 days	During febrile period.

DIPHTHERIA.

Diphtheria is a disease characterised firstly by the production by bacteria of local inflammation and a membrane, usually in the

throat, and secondly by severe constitutional symptoms resulting from absorption of poisons produced by the bacteria.

The disease is highly contagious, though not all persons are susceptible; it is not infrequent to find one child in a family affected, while the others escape. Though usually contracted by direct infection, not a small proportion of cases are due to infected milk. The disease can also be carried by inanimate objects such as clothes, toys and books. In certain cases, domestic animals have been suspected as the agent of infection. Owing to the peculiar nature of the bacillus, the source of infection is sometimes hard to trace and the disease to control. There are persons called carriers, who are either (1) those who have recovered from the disease, but still harbour the virulent bacillus in the nose or throat, or (2) certain immune subjects, in whose throats the bacilli flourish without producing the symptoms of the disease. Yet a third type of disseminator, not strictly speaking a carrier, must be considered; the subject of a mild attack, most commonly nasal in situation, but capable of transmitting the disease in a virulent form to others.

The incubation period is usually from 2 to 4 days.

Diphtheria is more commonly a disease of childhood, the highest proportion of cases occurring between the end of the first and fifth years. The incidence is proportionally smaller in infants, though the disease is by no means rare in the second half of the first year. The youngest subject observed by the writer was 8 days. The disease, unlike most infectious diseases, does not prevent a second attack, though there is immunity for one or two years.

Period of infectivity. The subject of diphtheria is infectious as soon as the disease becomes manifest or even earlier, as the bacteria may be harboured in the throat for days before symptoms develop. Usually the bacteria disappear from the throat within 2 to 4 weeks and the patient ceases to be infectious. Occasionally, however, though all traces of illness may have passed, the bacteria persist in active form for weeks or even months. It follows that the *period at which the patient may be considered free from infection depends not so much on time as on the result of bacteriological examination* and he should not be allowed out of isolation till three successive swabs, taken at intervals of four days, from the back of the nose as well as the throat have proved negative.

The *period of onset* is marked by the symptoms common to most fevers, there is headache, lassitude, loss of appetite and possibly vomiting, in the very young there may be convulsions. Though the patient may not complain of sore throat, the tonsils

and the back of the throat are injected and may present a curious smeary or gelatinous appearance. The glands in the neck are in some cases markedly enlarged and tender. In others there is no perceptible enlargement. Within twelve hours, the general symptoms have increased, the temperature is 101° to 104°F., with a rapid, often feeble pulse and considerable prostration. The degree of prostration and the rapidity of the pulse are out of proportion to the height of the temperature, an important characteristic of the disease. The child lies pallid and, save for involuntary restlessness, makes no effort to move. On one or both tonsils may be seen yellowish or greyish white patches which quickly spread and coalesce forming the false membrane. This membrane is with difficulty detached and if detached leaves a raw bleeding surface which is quickly covered once more. It is characteristic of the membrane that it tends to spread from the tonsil in various directions, commonly along the posterior edge of the palate to the uvula, which may be completely clothed in a dense glistening membrane. The surrounding tissues in the throat are red and swollen.

There is a curious absence of pain in the diphtheritic throat unless secondary infection, commonly streptococcic, is present. It follows therefore that early cases will be overlooked unless a routine examination of the throat is carried out in all cases of unexplained fever.

At this point, the further development of the disease will depend to a great extent on treatment: if antitoxic serum is given early and in adequate doses, improvement may be expected within twenty-four hours or even in twelve hours. The membrane instead of spreading may shrivel and begin to separate, and the general symptoms abate. Failing adequate treatment, the disease may manifest two of the dreaded complications of diphtheria, heart failure and laryngeal obstruction.

The poison of the diphtheria bacillus has a special affinity for the nerves and muscles of the heart, and it may be taken as an axiom that in every case the heart is affected to some degree and it is to be remembered that the majority of deaths are due to heart failure.

Heart failure may supervene at all times; it may occur during the height of the disease or it may occur during convalescence. It may be of gradual onset ushered in by vomiting or abdominal pain, the child becomes pallid or grey, the pulse becomes more rapid and weak or there may be that alarming symptom of the slowing of the heart rate to below the normal or marked irregularity of rhythm.

On the contrary heart failure may be of sudden onset, perhaps during some slight effort of the child, the raising of the head or the passing of a motion. At a later stage, even up to the third or fourth week, there is liability to failure under undue exertion. Cases of sudden death in the supposedly convalescent have been recorded and such records should serve as a warning and a guide. The electrocardiographic observations of the writer suggest that in every case of severe diphtheria when treatment has been delayed there is extensive damage to the heart muscle.

Laryngeal diphtheria in the majority of cases is secondary to faucial diphtheria, and results from the direct extension of the membrane into the larynx or even lower. Such an extension usually takes place on the fourth or fifth day of the disease and is heralded by a change in the voice or cry and a persistent husky cough. Happily, with the introduction of antidiphtheritic serum, this dangerous and highly distressing condition can, in the majority of cases, be averted. Laryngeal diphtheria is dangerous for two reasons: firstly, by extension of the membrane and multiplication of the bacteria, more poisons are formed; secondly, the airway is obstructed, not only by the membrane, but by œdema and swelling of the larynx, leading to the danger of suffocation. Such danger quickly becomes apparent, the face of the patient is anxious and dusky. The efforts to draw in breath become violent and forced with marked retraction of the lower ribs and exaggerated up and down movement of the larynx. The site of the obstruction may be localised by the stridor or snoring sound accompanying inspiration (croup). At this stage, the only treatment is tracheotomy, not only to avert suffocation and prevent broncho-pneumonia, but to relieve the already overtaxed heart from the effects of partial strangulation. During the preparations for this operation, an injection of atropine will do something to relieve the distress.

Broncho-pneumonia, a complication which may be regarded as preventable by timely treatment, is prevalent among hospital cases which are received usually on the fourth or fifth day or only when suffocation is imminent. It is due partly to obstruction and partly to the direct spread of the membrane down the bronchial tubes.

Nephritis is, in this country, rare and is of a mild character and leading to no permanent damage.

During the third or fourth week or earlier in the course of a severe case, or one which has come under treatment late, it may be noticed that there is an alteration in the voice, the patient "speaks through the nose" and some part of liquid swallowed flows back through the nose. If the palate is observed while the patient says

"Ah", it will be seen that there is no movement on one or both sides, in other words, paralysis has set in. The knee jerks are absent, otherwise there may be no signs. Paralysis may extend to the muscles of the eyes causing squint, to the muscles of the throat so that speaking and swallowing become difficult. In more severe cases the muscles of the limbs, or even of respiration, are affected.

The majority of cases recover in two to three months if the heart is not at the same time seriously affected.

Diagnosis.—The diagnosis of faucial diphtheria is not difficult bearing in mind the characteristic colour of the membrane, its tendency to coalesce with other patches and spread on to the surrounding tissues. It is this particularly which helps us to distinguish from follicular tonsillitis. In the latter the deposit on the tonsils tends to be discrete and even if the separate patches coalesce, they will not spread off the tonsil. Laryngeal diphtheria presents more difficulties, as in young, sick children it is practically impossible to get a view of the vocal cords. Any case in which there is huskiness or definite obstruction not yielding to suitable treatment within a few hours should be suspect and a swab taken for laboratory examination immediately. If the difficulty in breathing increases and the site of obstruction is clearly the larynx, antitoxin should be administered without waiting for the laboratory report. Care should be taken, however, to exclude broncho-pneumonia and asthma. In both these conditions an injection of atropine will cause marked amelioration of the symptoms.

Nasal diphtheria demands special mention as a condition liable to pass undiagnosed, so that the patient is a potential source of danger to others. Unless associated with faucial diphtheria, the general and consitutional symptoms are mild but the disease tends to run a prolonged course.

A persistent, irritating purulent discharge from the nose, especially if accompanied by bleeding or the passage of clots should arouse suspicion. Examination may reveal the presence of a membrane in the forepart of the nasal cavity.

Diphtherial membranes occasionally form elsewhere, on the conjunctiva of the eye, the vulva or on the surface of wounds.

Treatment.

Treatment is directed firstly to the neutralisation of the toxin by antitoxin, and secondly to the maintenance of strength, the protection of the heart and to dealing with such symptoms and complications as may arise.

The power of the antitoxin to avert a fatal issue is some ten times greater if administered on the first day of the disease than if administered on the fifth day or later. Delay even of a few hours is of importance as the antitoxin can neutralise the toxin as it is formed, but cannot undo its effects once it has acted on the cells of the body. The dose of antitoxin does not depend on the age or size of the patient, but on the amount of toxin which is to be neutralised, that is to say on the severity of the attack and the day of the disease on which it is administered. For a mild case of nasal diphtheria 8,000 units will probably suffice, for the average case from 20,000 to 30,000 units. In cases of great severity or when there has been delay, as much as 70,000 units may be required, of which 30,000 units should be given hypodermically or intramuscularly during the first twelve hours with subsequent injections of 15,000 units according to progress. Injections should be made into the outer side of the thigh and not under the skin of the abdomen as in the latter place they give rise to acute tenderness and may even cause retention of urine. In advanced cases we have used the intravenous route. On the whole the results have been good. In hospital cases, which are usually admitted late in the disease and in whom a secondary streptococcal invasion is almost invariable, we have obtained improved results by combining antistreptococcic serum 10 to 20 c.c. with the diphtheria antitoxin.

The patient after heavy doses of serum, not infrequently develops skin rashes, either of the measles or nettlerash type. A second form of reaction is the development of arthritis, the joints become swollen and painful. Such reactions need not call for alarm and may be controlled by the hypodermic administration of colloidal calcium and adrenalin.

Finally, if the child has previously received serum of any sort he is liable to anaphylactic shock on receipt of a second injection after an interval. In such cases he should be desensitised by the administration of fractional doses at hourly intervals as follows :—1st dose 0.1 c.c., 2nd 0.5 c.c., 3rd 1 c.c., 4th remainder of dose. Should symptoms of shock supervene, 0.5 c.c. adrenalin injection is administered.

It is unwise to attempt local treatment in young children. In older children the throat may be sprayed with 25 per cent. solution of magnesium sulphate in water, to facilitate the separation of the membrane. Of late we have added to the treatment a direct attack on the local condition with sprays of antistreptococcic serum. This has been found most effective in advanced faucial diphtheria with enlargement of the cervical glands.

The mouth also should be cleansed with some pleasant tasting wash such as glycothymoline, listerine or potassium chlorate solution disguised with tincture of myrrh.

The glands in the neck may be protected with cotton-wool. but should not be fomented unless there is difficulty in breathing.

The steam kettle, employed for ten minutes at a time, will give comfort, especially in hot dry weather. Carbolic acid, twenty minims to the pint of hot water, should be added.

Food must be administered with great caution; on the one hand the strength must be maintained, on the other, there is a particular tendency to dilatation of the stomach. Food must therefore be small in quantity at each feed, preferably not more than four ounces, easily digested. During the acute stage, peptonised milk to which a malted food such as Mellin's has been added, will be found the most suitable.

For general directions as to diet, the reader is referred to Chapter XXI.

During convalescence, iron tonics and cod-liver oil should be given, and the child guarded for some months against undue fatigue.

The prevention of heart failure.

The patient must be kept carefully at rest, he must be allowed to do nothing for himself and must not raise the head from the pillow in the acute stage. The routine administration of tincture of ephedra has proved of great value in preventing heart failure. For excessive rapidity of the pulse we have found strophanthone by hypodermic injection more reliable than digitalis. When there is evidence of advancing prostration, injections of adrenalin are indicated. Finally, for those patients who are exhausted by prolonged complications, such as pneumonia, intravenous injections of glucose (*see* Chapter XXI) may entirely change the aspect of the case.

In view of the fact that the danger of heart failure is still present in the third and fourth weeks, convalescence must be gradual and, except in the mildest cases, there must be no question of leaving the bed till this period has elapsed. Progress must be permitted entirely according to the observations on the pulse and blood pressure and, until it is clear that some slight advance has been made without signs of unfavourable reaction on the heart, no further advance should be made. The average mild case may be propped up in bed after three weeks and sit up after four; more severe cases must remain in bed for from six to eight weeks.

Treatment of paralysis.

Strychnine is regarded as having peculiar value in this condition. It may, with advantage, be combined with hexamine as follows :—

℞

Hexamine grain ½.
Tinct. nucis vom. minims 2.
Water ad 1 drachm.

Three times a day for a child of two.

Feeding, in the case of paralysis of the throat muscles, must be carried out by means of the nasal or stomach tube.

Some doubt has been thrown as to the value of serum when administered for the first time to the subject of diphtheritic paralysis. The consensus of opinion is in favour of its use and the author has seen some very remarkable recoveries attributable to its influence. In the later stages, i.e., after two months, electrical treatment may be employed for paralysed limbs.

Treatment of broncho-pneumonia.

The treatment of broncho-pneumonia is conducted on the lines laid down in Chapter XVIII. It is important that the secretions from the bronchial tubes should be free in order to carry away portions of the membrane which are adherent to the tubes. For this purpose it is desirable sometimes to double the strength of the expectorant mixture (No. 17). The foot of the bed should be well raised to promote drainage.

Treatment of carriers.

The treatment of carriers may present a serious problem as it is obviously undesirable to allow the convalescent patient, if there are still active bacteria in the throat, to mix with others. As mentioned above, the bacteria usually disappear quickly from the throat, but occasionally persist. In such cases the throat should be painted four times a day with resorcin paint (No. 35) and, if the tonsils are ragged or pitted, they should be removed after a period of not less than three months' convalescence.

In the case of nasal diphtheria, strong antiseptics cannot be applied, but a nose wash of sodium chloride, one drachm to the pint of water, will assist in clearing up the condition.

Except in the case of grave emergency, an operation should not be performed on a child who has recovered from diphtheria, until at least three months have elapsed.

For *preventive inoculation* the reader is referred to Chapter IX.

WHOOPING-COUGH.

Whooping-cough is an infectious disease, appearing in epidemic form, characterised by periodic, spasmodic attacks of coughing often culminating in vomiting, and often followed by a loud crowing sound, the whoop.

The disease spreads by direct transmission by the patient, the incubation period being seven to fourteen days. One attack, with few exceptions, confers permanent immunity.

Strict isolation should be enforced from the beginning, particularly should young infants and delicate children be guarded against the possibility of infection. To risk the spread of this disease by careless isolation is little short of criminal, as it is, not as is commonly supposed, a mild disease inevitable to childhood, but on the contrary, one of the most fatal diseases of early childhood. The date at which the patient becomes free from infection is difficult to fix, as the characteristic manifestation of the disease, the whoop, sometimes persists irregularly for months, but it is generally considered that *not less than six weeks from the commencement of the illness should be allowed for the infection to die out.*

Whooping-cough is most common before the age of three, even *the youngest infants are susceptible;* after the age of six the frequency diminishes, till, after twelve, an attack is unusual.

The course of the disease may be divided into four stages :

(*a*) The period of incubation during which there are no manifestations.

(*b*) The stage of catarrhal invasion during which the symptoms are those of a common cold with sneezing, running of the nose and eyes, cough and some fever. The transition from this stage to the spasmodic stage, in which the cough assumes the character which gives the disease its name, is of variable duration, from two days to three to four weeks, the period being shortest in the very young. *In some cases the true "whoop" is never heard, but the periodic attacks of apparently causeless coughing; leading to breathlessness, blueness and vomiting, will render the diagnosis clear.*

(*c*) The catarrhal symptoms abate but the cough becomes intensified, especially at night or under stress of excitement, till the true attacks of "whooping" become manifest. Each attack consists of a series of short explosive barks, so rapid that no breath can be drawn till the final crowing inspiration, the whoop, affords relief. During the attack, which may last from half a minute to two or three minutes, the face becomes purplish, the

eyes red and the veins of the head and neck stand out. Vomiting, especially if the attack takes place soon after a meal, is likely to follow and a quantity of sticky mucus is ejected. This vomiting is purely mechanical, is not accompanied by nausea, and does not affect the appetite; indeed, the child may ask for more food to take the place of that lost.

After a severe paroxysm the child is confused and exhausted, but quickly regains his normal state and returns to his play.

From the time the first whoop is heard, or the first paroxysmal attack takes place, aggravation may be expected for about a week, after which the disease may continue in varying severity for from three to six weeks, when the stage of decline begins. As said above, the actual crowing or whoop is not invariable and indeed, in very young children, is unusual.

(*d*) The stage of decline is marked by a diminution in frequency and severity of the paroxysms. During this stage there is commonly some degree of bronchitis which need cause no alarm, though should this develop early in the disease, or at this stage develop to any marked degree, it should be regarded as a complication calling for careful treatment. *Of all complications broncho-pneumonia is perhaps the most serious*, not only on account of the immediate danger, but also on account of the more remote risk of permanent damage to the lung in the form of chronic inflammation leading to fibrosis.

Rarely, the onset of tuberculosis may be traced back to this disease.

In the very young, the partial asphyxiation incidental to the paroxysm is liable to provoke convulsions. Subjects of this age are further liable to actual asphyxiation.

The occasional bleeding from the nose, the crimson spots on the white of the eye, due to rupture of a small vessel or the occurrence of a "black eye" need cause no alarm.

Apart from complications, the disease, except in the very young or delicate, runs a regular, though possibly distressing course, ending in complete recovery. The child may be considerably pulled down and emaciated after a severe attack, partly from interrupted sleep with nerve exhaustion and partly owing to the interference of adequate nourishment by repeated vomiting.

Treatment.

During the first stage (stage of catarrhal invasion) a careful watch must be kept on the condition of the lungs, and if there is a tendency to bronchitis, this must be treated energetically. Opportunity should be taken to build up the system against the time when nutrition may be impaired by vomiting.

Further treatment consists in alleviating and reducing the number of attacks. For this purpose the following mixture will be found efficacious :—

℞

Ephedrine sulph.	..	.. grain 1/6.
Tinct. belladonna	..	.. minims 2.
Vin. ipecac. ..	..	.. minims 5.
Pot. bromide ..	..	.. grains 2.
Phenazone ..	..	.. grains 1½.
Syr. tolu ..	..	.. minims xx.
Glycerine ..	..	.. minims xxx.
Water ad ..	..	.. drachms 2.

Dose suitable for a child of four. Two or three times a day according to the severity of the attack.

Progress is estimated by keeping a daily record of the number of the paroxysms. Oxygen is of service especially in infants and should be administered during the paroxysm, so that the first breath drawn may be sufficiently rich to relieve the suffocation without delay.

Vaccine.—The administration of specific vaccine has proved of value both as a preventive and in treatment. In the experience of the writer it is wiser not to use the vaccine till the paroxysms are controlled or the first dose or two is liable to exaggerate their violence. The result of vaccine treatment is that the duration of the disease is limited and its exhibition is particularly applicable in those cases in which the disease is prolonged. The dose advised for children between 8 months and 5 years is 0.2 c.c. of Whooping-cough Vaccine C, Parke Davis & Co., repeated every fourth day. As a preventive, experience has shown that, in the majority, complete protection is obtained though we have yet no figures to show how long the immunity lasts. There can be no question that, during epidemics, prophylactic administration of vaccine should be employed.

Unless there is fever, exhaustion or some complication, the child need not be kept in bed, and after the catarrhal stage, should take gentle exercise in the open air, provided weather conditions permit. Abundant fresh air is all-important, not only during the acute stage, but also during the stage of decline and convalescence.

During convalescence a visit to the seaside or to a dry hill climate is desirable, especially if there have been lung complications.

During the paroxysmal stage, efforts are made to reduce the condition of nervous instability, by which the attacks are

exaggerated. Undue excitement, overfatigue and heavy meals are studiously avoided.

The chest is rubbed daily with mustard oil or liniment of camphor or turpentine. This measure should not be omitted as it has an undoubted effect in controlling bronchitis.

The regularity of the meals should be kept as far as possible, but it may be necessary to anticipate the next meal time or supplement the last, when it has been lost by vomiting.

Experience has taught us that it is among the children in towns that the disease is most severe, runs the longest course and it is among such children, who have not the advantage of dust-free air, that permanent lung damage arises.

MEASLES.

Measles is an acute infectious and contagious disorder characterised by high fever, a well marked rash and symptoms of catarrh of the upper air passages.

The infection spreads direct from the sick person, though rarely it may be carried from the patient to a third person by an intermediary.

The patient is considered to be most infectious during the stage of catarrh, before the rash appears and may be infectious even before that stage. After the rash fades the infectivity gradually decreases.

Second attacks of measles are extremely rare, though authentic cases do occur.

No age is immune, though up to the age of nine months the natural immunity of the infant affords some protection. The *younger the patient, the more severe the attack is likely to prove.*

The stage of invasion is marked by a sense of chilliness, headache, nausea, furred tongue and gradually rising fever. In young children the attack may be heralded by convulsions. The child appears to be suffering from a severe cold in the head, the eyes are pink and watery, there is running from the nose and sneezing, the face is characteristically puffy and the glands in the neck may be slightly enlarged.

Two forms of eruption are to be seen within the mouth, both are of importance as in some $\frac{3}{4}$ of all cases they appear before the skin rash and enable the diagnosis to be made early and thereby to limit the spread of infection. (*a*) Koplik's spots are small white or bluish-white spots on a reddened base, situated in the mucous membrane of the inside of the mouth at the level of the lower milk molars. They appear some three days before the skin rash and disappear before the rash is at its height.

(*b*) Measles rash on the hard and soft palates. The spots resemble those which appear later on the skin but precede them by some twenty-four to forty-eight hours and persist for three or four days. In the experience of the writer, this rash never fails to appear and is therefore of the utmost diagnostic value.

In some cases there is a preliminary rash, in the form of mottling or roughening of the skin, preceding the true rash by some twenty-four hours. On the fourth day the *true rash appears on the face and neck* whence it spreads in a slow wave over the body, along the limbs till finally after two to three days both hands and feet, including the palms and soles, are involved.

The spots are at first minute, red and not raised above the surface. Soon they become enlarged, raised, so that they can be felt as well as seen, darker in colour and gathered into crescent-like groups. The whole body may be smothered with such groups, showing a marked lack of uniformity in colour, some bright pink, some almost purple, but with clear areas of white, unaffected skin between them. At times the itching is severe, especially at the height of the rash and during the early stage of desquamation.

On the second day of the appearance of the rash there is a noticeable enlargement of the glands of the neck and of the superficial glands of the whole body.

All traces of the eruption, save for a yellowish staining, have disappeared by the fourth or fifth day after its appearance, the fading beginning at the site in which the rash first made its appearance, and sometimes fading on the face, while not yet fully out on the limbs. There follows a period of desquamation up to one week, during which the skin is shed in bran-like flakes.

The fever, usually at about 102°F. at the onset, drops about the third day. On the fourth day when the rash appears there is a further rise, reaching the maximum of 104° to 105°F. on the second or third day of the rash. As the rash fades the fever falls rapidly reaching the normal on the seventh or eighth day.

Measles is by no means a trivial disease and there is reason to suppose that, of late years, epidemics have increased in severity. In India the disease on the whole runs a mild course, though there is still a tendency to grave complications if care is not taken. Further, the disease appears in many cases to undermine the constitution, and may either lay open the road to tuberculous infection, or light up some latent infection already present. *The very young are the most susceptible to the disease, so should be guarded as far as possible from the infection.*

Signs of severity.—(*a*) Recession of the rash. In former years this sign was regarded as evidence of "measles striking inwards" and to this cause was attributed the serious condition

of the patient. The disappearance of the rash is, however, effect and not cause, and is due to circulatory failure and is therefore an indication for active stimulation.

(*b*) Prostration with furred tongue and a tendency to delirium.

(*c*) Duskiness of the rash with a tendency to hæmorrhagic spots.

(*d*) The persistence of fever after the disappearance of the rash indicating the supervention of some complication.

Complications.

(1) Convulsions, in the very young, usually occur at the commencement of the disease, they take the place of a shivering attack in older children and are not of such serious import as when occurring later in the course of the disease.

(2) Lung complications. Some degree of mild bronchitis is almost invariably present during the acute stage of the disease and is to be looked on as an inevitable part of the disease. Not infrequently, however, especially in cold climates or when the patient has been exposed to chill, the bronchitis becomes more grave, the breathing becomes hurried and grunting and broncho-pneumonia develops.

(3) Inflammation of the ear. The frequency of this complication varies in different epidemics, and the liability is increased by exposure to draughts. The condition may pass on to serious suppurative disease of the middle ear or mastoid.

(4) Sore throat, laryngitis not infrequently with croupous symptoms.

(5) Inflammation of the kidney is an unusual but none the less possible complication.

Diagnosis.

The diagnosis of measles is not difficult bearing in mind the typical puffy face with watery pink eyes, the sneezing and feverishness, *the rash on the palate, the long stage, four days between the first signs of illness and the appearance of the rash, which passes like a wave over the body.*

Unlike the early stages of smallpox, there is no abatement of the fever with the appearance of the rash.

Treatment.

The general treatment of measles lies mainly in the *prevention of complications*, particularly lung complications, which in the average case, constitute the only menace.

The child should be confined strictly to bed in a well ventilated room free from draughts; in cold weather the

temperature of the room should be kept at about 65°F. Bed clothing should be adequate, but not excessive to a degree to cause increase of the fever. The ears may, with advantage, be protected by a loose woollen cap and the eyes, if sensitive, shaded from the light by a shade.

The diet should be adequate and simple, any starvation system should be avoided. The bowels are regulated with the aid of mild saline aperients. The simple fever mixture will help to promote the efficient action of the skin and kidneys.

Should *bronchitis* be a prominent symptom, an expectorant mixture containing creosote is recommended as the mixture may be effective in the prevention of more severe affection of the lung. If, however, in spite of all precautions, *broncho-pneumonia* does arise, the case will be treated as such on the principles laid down in Chapter XVIII.

The patient suffering from broncho-pneumonia should not occupy the same room as other children suffering from uncomplicated measles.

For *laryngitis,* the steam kettle for ten minutes at a time containing Friar's balsam, one teaspoonful to a pint of water, will give relief. For troublesome *cough,* a simple mixture of glycerine, honey and lemon juice, in equal parts, one teaspoonful at a time, will be appreciated by the patient and recourse may be had to a linctus (No. 23).

Examination of the throat should never be omitted, and should there be a suggestion of a false membrane, it should be examined for the presence of diphtheria bacilli.

Pain in the ear may be treated by fomentations and warm drops instilled (*see* Chapter XXVIII), but, should the pain persist and the fever rise, expert advice should be invited.

The *eyes* may require attention, they should be bathed twice daily with boracic or saline lotion and, should the lids be stuck together by the dried discharge, they should be smeared along the margins with yellow ointment.

The convalescent child requires special attention. As has been said above, measles has a particular tendency to undermine the constitution and parents should not be satisfied till a complete restoration of health, vigour and progress is re-established. The child should, as far as possible, spend the day in the open air, carefully guarded from chills and overfatigue. The diet should be generous; cod-liver oil and iron should be given as tonics.

As measles is so common, infectious and may be so dangerous a disease, any school child with a cough, sneezing, and redness of the eyes should be isolated. *Any child who has been in contact*

should be examined daily for Koplik's spots and the rash on the palate and, should the first case prove to be measles, placed in quarantine for sixteen days.

No child, who has recently suffered from measles, should be allowed to mix with others until a month after the onset of the illness.

There is no necessity to destroy books, clothing, etc., which have been used by the patient, but the sick-room should be thoroughly aired and left unoccupied for a week.

GERMAN MEASLES.

German measles is a mild infectious disease, epidemic in outbreak, commonest at the ages of from 5 to 15, though no age is immune.

The importance of German measles lies in its liability to be confused with true measles, from which disease it affords no protection.

The distinguishing points are :—

(1) The sudden appearance of the rash without or with only the slightest previous illness or catarrh.

(2) The character of the rash. The rash develops rapidly; within twelve hours of appearance, the face, body and limbs, down to the palms and soles, are covered. The total duration is from two to four days, sometimes less.

The spots are pale rose in colour, do not form groups, but sometimes run together on the face or on parts exposed to pressure. There may be spots within the mouth appearing at the same time as the rash, but persisting for half a day only.

(3) The temperature usually falls abruptly when the rash is at its height. At the highest, the thermometer seldom registers more than 101° to 102°F.

(4) The glands at the back of the neck are enlarged and this has been regarded as a distinguishing feature. Too much reliance, however, should not be placed on this sign, as, at the height of the eruption of true measles, the same glands are enlarged.

Recovery is usually complete in six to eight days. Many authorities regard isolation, in view of the mildness of the disease, as unnecessary within the household, unless there are delicate or very young children within the house. Isolation from others, however, must be enforced, as not every one will be found to share these views.

SCARLET FEVER.

Scarlet fever is a disease of rarity in India, but periodically limited outbreaks are recorded usually in hill schools. When

isolated cases appear in the plains, they tend to be atypical and remarkably free from infectivity. In view of the increasing facilities for transport between Europe and India, it is possible that the disease may become more common.

Scarlet fever or scarlatina is a highly infectious disease characterised by a red rash, high fever and inflammation of the tonsils. The disease is commonly conveyed direct from the sick to the healthy, but the infection may be carried by inanimate objects, such as clothes and books, while many epidemics in England are recorded as disseminated by milk.

The seat of infection is now regarded as being in the mucopurulent discharge from the nose, throat or ears rather than in the shed scales of skin. The period of incubation is from one to four days, most commonly from three to five.

The *symptoms* vary greatly according to the intensity of the attack; they may consist merely of indisposition accompanied by the characteristic rash or there may be an onset of such severity that prostration with delirium, and acute septic inflammation of the throat rapidly set in. In a typical case, the onset is sudden with sensations of chilliness and vomiting. In infants, convulsions may usher in the attack.

The temperature rises rapidly to 103° or 104°F., with a pulse rate rapid in proportion. Attention is soon called to the throat by complaints of pain or difficulty in swallowing. The tonsils are red and inflamed and sometimes exhibit yellowish patches. At this period, a rash more or less identical with that which develops later on the skin, is to be seen on the palate and throat, spreading to the inner lining of the cheeks.

The tongue, at first coated, sheds the fur and presents the appearance known as "strawberry tongue", a red tongue with numerous lighter raised spots on the surface.

Within twelve to twenty-four hours the rash appears on the neck and upper part of the chest. This consists of a number of minute red spots so closely packed together as to suggest an uniform red blush. The rash spreads over the trunk to the arms and later to the legs. The face shows a comparative immunity, the forehead and area round the mouth stand out white in marked contrast to the blush overlying the rest of the face. The rash itches and there is often swelling of the skin especially over the hands and feet. The duration of the rash is short; reaching its height at the end of the third or the beginning of the fourth day of the illness, it totally disappears by the sixth or seventh day.

The inflammation of the throat reaches its height at the same time as does the rash. The condition here is of the greatest importance as, *on the degree of the inflammation of the throat*

would appear to depend the general outlook of the case and the tendency to the more grave complications. The inflammation is of all grades from simple redness to acute ulceration with the formation of a false membrane resembling that of diphtheria. This inflammation may spread to the nose, resulting in a purulent discharge.

The temperature remains high till the rash begins to fade and, providing that the inflammation of the throat is not severe, falls and reaches normal by the ninth or tenth day.

After the fading of the rash, desquamation or shedding of the skin sets in, the skin being shed in minute flakes on the head and neck, but tending to come off in strips elsewhere especially from the hands and feet. The process of desquamation lasts from ten to twenty-four days or even longer, and its termination is taken as a sign that infection is at an end, though from seven to eight full weeks should be allowed before the child is allowed to join his fellows.

As said above, the occurrence of *complications* seems to depend in a large measure on the intensity of the throat infection. As the result of direct spread along the Eustachian tube, suppuration sets up in the middle ear with perforation of the drum and sometimes permanent deafness.

In scarlet fever, there is a particular tendency to the development of inflammatory conditions of the kidneys. In the early stages, there is albumin and sometimes casts in the urine, but in a degree not more intense than accompanies other acute fevers. About the third or fourth week the more typical *nephritis* is liable to develop. There is an interesting connection between the septic inflammation of the throat and that of the kidneys. This has a clear parallel in other septic infections of the tonsils, which lead to infections of the kidneys far more often than is commonly supposed.

However mild a course the disease may run, it should be borne in mind that the kidneys suffer to some degree in all cases and that grave disease may be excited by exposure to cold and errors in diet.

The onset of nephritis is commonest in the third or fourth week. The amount of urine passed is suddenly diminished, and is smoky in colour from an admixture of blood, the face is puffy and symptoms of uræmia, headache, vomiting or even convulsions may follow. In the majority, the onset of nephritis is insidious, and there is a tendency to relapse after apparent recovery. Scarlatinal nephritis is of especial gravity as there is danger that the acute form may pass into the chronic with permanent damage to the kidneys.

Scarlatinal arthritis occasionally develops, the joints usually affected are those of the fingers, wrists and elbows. The occurrence of post-scarlatinal heart disease is commonly associated with the development of joint inflammation, and in some cases is probably due to a superadded rheumatic infection.

In contrast to measles, the development of respiratory complications is not usual.

The *diagnosis* is not as a rule difficult, though when the rash appear in atypical form, there may be some difficulty in distinguishing from measles. The absence of the marked catarrh of measles and the day of the illness on which the rash appears will assist in forming an opinion. In scarlet fever, the diagnostic points are the inflammation of the throat, the early appearance of the rash, the circumoral pallor and the rapid pulse.

Treatment.

The patient is rigidly isolated for at least seven weeks and confined to bed for not less than three weeks. While ventilation should be adequate, draughts or chill should be carefully avoided.

In the early stages, the simple alkaline fever mixture is useful. The diet is modified to throw no unnecessary strain on the kidneys. During the febrile stage, milk and easily digested farinaceous food is given, while foods such as eggs, meat and fish, containing a high protein content, are reserved till convalescence is established. For the control of fever, warm sponging may be employed, with special caution against chills. Antipyrin in small doses may be used when there is restlessness or a tendency to delirium.

The condition of the throat demands active attention. In all cases, a mild throat spray of boracic acid or saline should be used or throat paint No. 34.

When there is evidence of ulceration or yellowish patches appear upon the tonsils, stronger antiseptic applications should be used; the throat paint No. 35 or the throat be swabbed with hydrogen peroxide diluted 1 to 4.

Poultices or fomentations applied to the outside of the throat will do much to relieve the acute discomfort.

The urine should be tested frequently for the presence of albumin, casts and blood, and on no account should the patient be allowed to leave his bed or any advance of diet made so long as these substances are detected. Should dropsy or other serious signs of involvement of the kidneys supervene, the case is treated as detailed in Chapter XVII.

The skin is annointed daily with olive oil, in which thymol 1 per cent. is dissolved or with eucalyptus oil. Carbolic oil should

not be used for young children. During the acute stage, stimulants (*vide* Chapter XXI) may be required.

Inflammation of the joints is treated with salicylates on the grounds that there may be some rheumatic taint (Chapter XXII).

Inflammation of the ear is treated on general lines (*vide* Chapter XXVIII).

The conduct of convalescence must be influenced by the consideration that the kidneys are in a susceptible condition. Violent exercise, chill and cold bathing are to be avoided and a periodic inspection of the urine is advisable.

For the generally debilitated condition, iron tonics are indicated.

Finally, the patient must be considered infectious not only till peeling is completed, but so long as there are purulent discharges from the ear, nose or broken down glands.

MUMPS.

Mumps is a disease of childhood and adolescence appearing in epidemic form and characterised by inflammation and swelling of the salivary glands at the angle of the jaw.

The disease is spread only by direct infection from the sick person, who is infectious in the very early stages of the disease and remains capable of transmitting the disease, though in diminishing degree, up to some twenty-one days from the onset. One attack almost invariably confers life-long immunity.

The period of incubation, from the time of exposure to infection to the appearance of the disease, is most commonly between fourteen and twenty-one days. Adults as well as children are susceptible, though the commonest age is between 5 and 15. Under the age of two, the disease is rare.

A feverish cold and stiffness of the jaw are the earliest signs. Following this stiffness there appears, usually at first on one side only, a hard painful swelling immediately in front of the ear, extending; as it increases, behind the angle of the jaw, pushing the ear forward and limiting the movements of the jaw. The situation of the inflammation in the early stages is characteristic, and is that of the parotid gland. As the inflammation increases, the outline of the gland is lost and the swelling may extend even up to the eye and down on to the chest. The second side is usually affected some two days after the first.

With the swelling there is fever, not as a rule above 102° to 103°F., with its attendant symptoms, lasting for two or three days. The pulse rate may rise, but in some cases there is marked slowing.

The swelling reaches its maximum about the third or fourth day, after which there is gradual subsidence, with complete recession of symptoms on the eighth or ninth day, though enlarged and hardened lymphatic glands may persist for some time. In certain cases, the swelling, after subsidence in the jaw, reappears in the testicle of the male and in the breast or ovary of the female. This complication is rare in children under the age of 12. Some patients complain of pain in the upper abdomen, of varying severity and necessitating careful dieting and hot fomentations.

The *treatment* of mumps is simple and consists, during the acute stage of (*a*) rest in bed, (*b*) saline aperients as necessary, (*c*) the simple fever mixture, (*d*) fomentations to the painful swellings, (*e*) the regular use of a mouth-wash. Later, the painting of the swellings with iodine may hasten the subsidence. The patient may be considered free from infection four weeks after the first appearance of the disease.

CHICKENPOX.

Chickenpox is a mild infectious disease characterised by the presence of vesicular spots and slight constitutional disturbance. The disease is transmitted by direct contact to a second person or may be carried by a third person, by clothing, books or toys. The patient is infectious in the earliest stages of the disease and remains so long as the scabs persist. The disease in the tropics is liable to be more severe, sometimes the patient is so covered with large pustular "pocks" that it is only by careful attention to the diagnostic points that the condition can be distinguished from smallpox.

The period of incubation is most commonly fourteen days from the time of exposure to infection. One attack, except in instances of extreme rarity, confers immunity.

The earliest sign of the disease is commonly the appearance of the rash though there may be slight general symptoms for twenty-four hours before this. The rash usually appears on the back and face; at first the number of spots may be so small as to escape observation. The spots may be situated on all parts of the body including the scalp, palms and soles and inside the mouth; they are more numerous on the body than on the limbs. The first appearance is that of little red pimples; at the end of twenty-four hours many of these have developed into small blisters of vesicles, retaining a narrow red margin. Drying up begins almost as soon as the vesicle has attained full size and in three to four days a yellowish crust is completely formed. After some five days the crusts begin to fall off, though some may remain adherent for from two to three weeks. A slight reddening of the skin is left

on the site of the fallen crust. The majority of the spots stop short at the pimple stage and subside without developing into the vesicle. A variable number of spots, however, enlarge and become pustular, with yellowish areas surrounded by an intensely inflamed areola.

An important characteristic of the lesions of chickenpox is the tendency to appear in successive crops. The appearance of these crops differs materially from the progressive eruption of smallpox in that a new crop is not confined to one situation, but is spread impartially over the body so that spots of all ages are found side by side. The lesions do not as a rule extend so deeply into the skin as do those of smallpox and consequently do not lead to scarring unless infected. It is, therefore, important to prevent children from tampering with the spots.

Fever usually starts at the same time or a few hours ahead of the rash. The degree varies according to the severity of the rash, it may be but slight but in tropical chickenpox it is more commonly high, 102° to 103°F. and persistent for four to six days with considerable constitutional disturbance.

Complications or any ill-effects from the disease are rare and the treatment is that of any febrile disorder. The child should rest in bed till the fever has subsided, be kept indoors for a few days and be guarded against chill. Isolation is necessary till all crusts or scabs have fallen.

SMALLPOX.

A highly contagious eruptive fever, attacking persons of all ages. Children are especially susceptible, even the new-born babe is attacked if the mother is suffering from the disease.

Smallpox is the most infectious of all diseases, it is transmitted by direct contact, carried by clothing, letters, etc., by insects, by healthy people, and the infection lies in the crusts or scabs and may possibly pass through the surrounding air. The virus or poison retains its vitality for a long time and may live in inanimate objects, clothes, curtains, etc., for months. The patient is infectious from the first day of illness, if not before, and ceases to be so only when the last scab has fallen.

About twelve days elapse between the exposure to infection and the appearance of symptoms. As a rule the recovered patient is immune to further attacks and even should he be attacked, the second attack is of extreme mildness.

The disease is described in four varieties :

(1) *Modified smallpox* in the subject partially protected by vaccination: usually mild with few spots and comparatively slight general symptoms.

(2) *Discrete smallpox,* and (3) *Confluent smallpox.* In the former the pustules are distinct, in the latter they run together and form large patches so that the face and body are almost entirely covered. These two varieties are in reality only differences of degree, the severity being proportionate to the intensity of the eruption.

The fourth variety, *Hæmorrhagic smallpox,* is of such virulence that death takes place before the typical eruption has appeared.

The course of the disease is marked by definite stages. The first, the stage of invasion, the second, the stage of eruption, the third, the stage of secondary or suppurative fever and the fourth, the stage of desquamation.

The stage of invasion is ushered in by violent shivering, or in the very young, by convulsions. Vomiting and diarrhœa are usual, whilst the severe headache and pain in the back are characteristic. The tongue is furred, the urine scanty, the temperature rises rapidly to 103° to 104°F. and the patient becomes drowsy, apathetic or even delirious.

On the second day, the symptoms are unabated and there may be a *preliminary rash,* resembling measles, though this is less common in children than in adults. The symptoms and the fever show no signs of remission till the third or fourth day, when the true rash appears.

The rash first makes its appearance on the face and wrists, then on the head, hands and arms, and in twenty-four hours spreads to the lower limbs and body, requiring some three days to develop to its fullest extent. It is distributed more profusely over the upper half than the lower half of the body, the flanks tend to remain clear, and over those parts of the body which are habitually exposed to the air, the eruption is most intense.

Before becoming plainly visible the eruption can be felt especially on the forehead, as hard papules like shot beneath the skin.

The eruption passes through four stages (1) papule (pimple), (2) vesicle (small blister), (3) pustule, and (4) crust. At first the rash consists of a number of red elevated papules which come up through the skin and do not merely lie on the surface. They are solid and hard, but at the end of forty-eight hours, a minute vesicle has appeared in the centre which grows till it occupies the greater part of the surface of the macule. At the end of the fifth day, the lesion presents the appearance of a small blister filled with greyish whey-like fluid, more or less oval in outline, depressed in the centre and with a red margin. The surrounding skin is raised and puffy.

Within forty-eight hours after full development, the pock becomes yellow, the clear fluid contents having become converted into pus (matter) and the red margin, as well as the surrounding inflammation, is increased.

During the process of ripening, that is, while the vesicles are changing to pustules, the surrounding skin swells, so much so that eyes become closed and the whole face swollen out of recognition.

At the same time, lesions similar in character may develop at the back of the throat, in the nose and in the conjunctiva of the eye. Here the lesions run the same course, but tend to rupture early leaving an ulcerated surface.

The development of pus in the pocks marks the inception of the third stage of the disease. The fever and constitutional symptoms, which have moderated during the development of the eruption, now become accentuated. The temperature rises steadily to 103° to 104°F., there is marked prostration with weakness of the heart, mental depression or delirium. There is severe pain over the eruptive areas, which, if discharging, emit a foul odour, the throat is sore, there is diarrhœa, and often severe cough. This stage lasts for five or six days, at the end of which time, in favourable cases, the lesions begin to dry up and the temperature falls slowly to normal.

The drying up or stage of desquamation, the fourth stage of the disease, is well in progress by the fourteenth or fifteenth day and some of the crusts begin to fall. The more acute symptoms have abated, but the patient is extremely weak, often mentally as well as physically.

Following the shedding of the crusts, brownish pigmented areas are left which persist for weeks. The skin is shed in a bran-like desquamation.

Though most of the crusts separate readily, some remain adherent even up to the fourth week, particularly on the hands and feet, a point of importance in the examination of the patient as to freedom from infectivity.

The general symptoms and stages of confluent smallpox differ in degree only from those described above.

The most frequent *complications* are those attacking the air passages and lungs. Laryngitis may be severe, the larynx having been invaded by the eruption. Bronchitis is present in almost all cases and the development of pneumonia renders the outlook extremely grave.

After the development of the eruption, the case should, as a rule, present no difficulties, though, in tropical countries chickenpox, if seen at its height, may cause some doubt. Severe

chickenpox may be taken for smallpox and, on the other hand, mild smallpox may be mistaken for chickenpox.

The main points of distinction are :—

Smallpox.	Chickenpox.
Severe illness before eruption. Rash distribution:—Face, extremities most intense. Marked papular stage, vesicles develop slowly. Spots in one locality all at one stage of development.	Stage of invasion twenty-four hours or less. Rash may be the first sign of the disease. Rash distribution:—Trunk, especially back. Vesicles develop rapidly. Spots in all stages of development side by side, many spots do not mature.

In the early stages the preliminary rash may be mistaken for measles, but appears earlier in the disease and is not accompanied by catarrhal symptoms. In smallpox the severe pain in the head and back are suggestive.

The prospects of a case depend (1) chiefly on whether the subject has been previously vaccinated or not. Even imperfect vaccination will, in all probability, modify the attack and render it less dangerous (Chapter IX). (2) A mild introductory fever or first stage indicates a mild attack. (3) A scanty eruption is evidence to the same effect. (4) The most favourable age of the subject is between the tenth and fifteenth year and (5) a previously strong constitution will materially assist in resisting the exhausting suppurative stage.

Treatment.

The objects of treatment are—

1. To maintain the strength of the patient.
2. To prevent as far as possible prostration and collapse.
3. To mitigate the intense discomfort of the disease.
4. To limit as far as possible suppuration in the lesions and subsequent scarring.

The diet should at first consist of skimmed or diluted milk, strong soups or beef tea, bread and milk and easily digested cereals. This diet may be increased with discretion according to the lines laid down for the general treatment of fevers. It should be remembered, in the early stages of the disease, that the exhausting suppurative stage has yet to be encountered, so that the vital powers should never be allowed to flag for want of proper nourishment.

Against the danger of prostration, which may supervene with suddenness, the greatest care and watchfulness are necessary. If at any time the pulse becomes quicker and more feeble, the surface pallid, and the pustules assume a flabby half empty

appearance, if, at the same time, there be increased restlessness or delirium, then we must push alcoholic stimulants with increased vigour.

The eyes should be carefully tended. Ablution with an eye lotion (Chapter XXIX) and the application of a simple ointment to the edges of the lids if they stick together, will generally be effective in preventing serious damage. The hair should be cut short.

Violent purgation should be avoided though the bowels should be regulated with moderation. The ordinary fever mixture (No. 21) may be given during the primary fever, but need not be continued during the second stage, when the temperature is not high. In the third stage, benefit will be derived from a stimulant mixture No. 26(*a*). Good results have been reported from the administration of xylol, 20 to 30 minims for children, three times a day in water or milk.

The prevention of irritability of the bowels and diarrhœa will call for attention. Prescription No. 9 with opium will be found useful for such purposes, and will be found of double benefit if there is, at the same time, delirium. When the condition is not severe, the same mixture without the addition of opium, may be employed.

It is important to bear in mind that the lesions of smallpox tend to be most numerous where there is or has been most irritation. For this reason, frequent ablutions with soap and water, or the application of strong antiseptic lotions should be avoided before the rash is fully developed. On these grounds the practice of excluding all actinic rays and treating the patient in a red light has been instituted. This method has not proved of great value. The covering of the face with equal parts of olive oil and lime water, well shaken into an emulsion, twice daily, certainly proves of some benefit and excludes the air. The application should be made gently with a camel-hair brush.

The following application, recommended in the Bengal Smallpox Vaccination Manual, is useful :—

Acid salicylic	6 drachms.
Thymol	2 ,,
Eucalyptol	2 ,,
Menthol	2 ,,
Ground nut oil	1 pound.

To be smeared daily all over the body till eruptions and scabs disappear.

The prevention of smallpox is simple: it is by vaccination and revaccination. It is lamentable that in India, even among the European community, lives are still lost by neglect of this

simple precaution. Certain classes of Indians entirely disregard the dangers of infection, and the householder may discover that the house servants are going freely backwards and forwards to and from an infected house or person. The infection is so pervasive that there is no avoidance except by vaccination.

Scheme of precautions to be taken when a case of smallpox occurs in a house :—

1. Every person to be vaccinated or revaccinated.
2. The patient to be isolated or if possible sent to a suitable isolation hospital.
3. Carbolised sheets to cut off the sick room from the rest of the house. The greatest care should be taken that flies do not enter the sick room.
4. All clothing, bedding and utensils used by the patient, to be thoroughly disinfected immediately on leaving the sick room. Clothing should on no account be sent to the wash without previous disinfection.
5. All dejecta to be treated with strong antiseptics.
6. The attendants to wear special gowns when in the sick room and not to mix with others and should gargle when coming off duty.
7. On recovery the body to be searched for crusts. The fall is usually complete in from four to six weeks, and the patient should then be given one or more baths in corrosive sublimate solution one in ten thousand. This solution is highly poisonous and should not enter the mouth or eyes. It should be washed off with clean water before drying.
8. The fullest disinfection of the room and of anything which may have been in contact with the patient should be carried out. Books and toys should be destroyed.

INFLUENZA.

Influenza is an infectious epidemic disease, attacking subjects of all ages, characterised by severe febrile symptoms, catarrh and prostration with a tendency to a prolonged period of debility after the attack.

The incubation is from one to three days and the patient is infectious so long as catarrhal symptoms persist.

The form of the attack, as well as the tendency to some particular complication, varies markedly not only in the epidemic but in the individual, though as a rule the cases of one epidemic run true to type.

The typical attack sets in abruptly with shivering, a feeling of prostration, and pains in the head, limbs and back. The limbs, though painful, are free from tenderness. Catarrh, with running

of the eyes and nose, is usual, and there may be some cough and bronchitis. The fever rises rapidly, but runs an irregular course, the pulse rate is variable and sometimes slow in proportion to the temperature (*vide* Chapter X). Most characteristic is the sensation and appearance of extreme weakness out of all proportion to other signs of illness.

The appetite is lost, vomiting and diarrhœa are not infrequent. The usual duration of the disease is from one to five days, though the fever may persist for longer periods or the disease be prolonged by complications.

One attack does not convey immunity, rather does the attack appear to predispose to a second or more severe attack some weeks or months later. Relapses are not uncommon.

As a rule, it may be stated that the disease is less severe in children than in adults, though there are exceptions.

According to the prevalence of certain types or groups of symptoms, three distinct forms of the disease are described, viz.—(a) the catarrhal, with predominance of nasal catarrh, bronchitis and a tendency to lung complications. This type is more common in older children in contrast to the other two types, (*b*) the nervous type, and (*c*) the gastro-intestinal type, which are to be seen more often in the very young.

The nervous type is characterised by the presence of high fever, marked impression on the nervous system, stupor, apathy, delirium, convulsions, or even signs of meningitis.

The gastro-intestinal type, in which the symptoms of vomiting, diarrhœa and severe abdominal pain are prominent, may give rise to some difficulty in diagnosis. The attack may closely resemble the severe gastro-enteritis of early childhood, or the marked pain and vomiting may suggest the presence of some surgical condition within the abdomen. Not infrequently the diarrhœic stools show the presence of blood and mucus. The duration of such attacks is usually from three to four days, but may be considerably longer.

The diagnosis of difficult cases will be assisted by an enquiry into the occurrence of more typical cases.

It would appear that during an attack of influenza the resistance is so lowered that infection, often other than that of the original disease, tends to attack the weakest spot; consequently each child is liable to complications as his constitution dictates; for example, the child subject to recurring attacks of bronchitis will, in all probability, develop severe bronchitis during or after the attack.

Apart from this, each epidemic appears to carry with it a special tendency to some particular form of complication, it may

be bronchitis, pneumonia or inflammation and suppuration of the middle ear. In the epidemic of 1918, lung complications were common and responsible for a high percentage of the mortality. In a recent epidemic in England, suppuration of the middle ear was recorded in many cases.

In children, swelling of the glands in the neck commonly appears. The heart is sometimes found to be dilated and irritable after the disease, leading to breathlessness on exertion with a disproportionate acceleration of the pulse rate. Such a condition will usually pass off with returning health, leaving no trace.

Finally, the weakness engendered by the attack, may lay open the path to infection by the bacillus of tuberculosis.

Treatment.

There is no specific treatment for influenza. In general, the coal-tar derivative drugs, especially aspirin and phenalgin, are of value in relieving the pain in the limbs, the headache and in moderating the fever. Such drugs must be administered with caution in young children.

A mixture as follows may be given :—Oil of cinnamon minim ¼, oil of creosoti minim ¼, tinct. camph. co. minims 1½, tinct. benzoini minims 2½, syrup tolu minims 10, water to one drachm. Give one drachm at two years old, two at four and three at eight. If there is cough, ipecacuanha wine 2 to 5 minims according to age may be added. It may be more convenient to administer oil of cinnamon, which is regarded by some as a specific, in milk as follows : one drop of oil of cinnamon in two teaspoonfuls of milk to a child of four.

The patient must be confined to bed for at least three days after even a mild attack and convalescence must be guarded. Iron tonics, cod-liver oil and malt are given and a change of air, preferably to the seaside will hasten the restoration to health.

Authorities are not agreed upon the value of protective inoculation against influenza. The immunity conferred is of short duration only, about three months, so that, for practical purposes, the use of protective vaccine will be limited to times of epidemic and administered especially to those children, who, by reason of some constitutional weakness, are regarded as specially liable to develop complications in the event of their contracting the disease.

The dose of vaccine for children is as follows :—

Age from 10 to 16	2/3 adult dose.
" " 7 to 10	1/2 " "
" " 2 to 7	1/3 " "

CHAPTER XXVI.

ENLARGEMENT OF GLANDS.

The lymphatic glands are distributed all over the body, both superficially and deep. The superficial glands are grouped chiefly in the folds of the large joints, the axilla, elbow, hip and knee and also in the neck. The glands are linked up into a system by the lymphatic vessels and each gland or group of glands drains the tissues in its neighbourhood.

In health, save in the very thin, the glands are not perceptible, but in childhood there is a particular tendency to enlargement often from trivial causes.

The more common types of swelling of the lymphatic glands may be described as follows :—

(*a*) *Acute inflammatory.*—Such enlargement is caused by some irritative or septic area draining to the gland and will be situated according to the area affected. The gland acts as a filter or barrier preventing the further dissemination of infection throughout the body; bacteria or toxic products are here held up and as the body tissues or the infection prevails, so will the swollen glands subside or suppurate.

The common examples of acute inflammatory enlargement of the glands are :—

(1) From acute follicular tonsillitis, diphtheria or scarlatinal throat.

Situation.—Immediately behind the angle of the jaw and spreading down the neck in front of the sterno-mastoid muscles. The gland or group of glands immediately behind the jaw is known as the tonsillar gland. The routine examination of the sick child should invariably include inspection of this gland, as its enlargement may reveal some infection of the throat otherwise unsuspected.

(The sterno-mastoid muscle extends from the skull immediately behind the ear to the junction of the collar-bone and breast-bone dividing the superficial area of the neck into two spaces spoken of as the anterior and posterior triangles.)

(2) From decayed and septic teeth, ulcers in the mouth, infection within the nasal cavity, especially in association with adenoids (anterior triangle).

(3) From inflammation of the outer or middle ear.

Immediately under the ear and running in a chain to the posterior triangle.

(4) From skin diseases of the scalp.

Situation according to the area of scalp involved, most commonly the posterior triangle.

(5) From septic sores on the hands, infected skin disease and scabies—In the arm-pit and back of elbow.

(6) Septic sores or blisters on the foot or leg; sores or inflammation in the region of the anus or genitals—In the groin.

(*b*) *The result of acute general disease.*—The superficial glands all over the body may be involved but the enlargement is as a rule most marked in the neck. Scarlet fever, in which there is a marked tendency to suppuration, measles and German measles Certain inherited constitutional disease.

The lymphatic glands, when acutely inflamed, may be felt like hard kernels underneath the skin, often causing visible protrusion. They are extremely tender and the limb or neck may be fixed in a position of flexion to relax the tissues over them.

If the cause is speedily removed, the glands subside, but unrelieved, the skin over the inflamed area becomes reddened, a series of fine red lines (lymphangitis) appear in the skin running to the glands, the skin itself partakes in the general inflammation and finally an abscess forms.

(*c*) *Chronic inflammatory enlargement.*—All the cases which produce acute inflammatory enlargement may produce chronic enlargement if the infection is not of sufficient virulence to cause suppuration and the source of irritation is not removed or recurs.

The commonest causes of chronic enlargement of the glands of the neck may be said to be *recurrent infection of the tonsils, infected adenoids, chronic suppurative disease of the ear and parasitic infection of the scalp* (pediculosis).

(*d*) *Certain children,* at periods of ill-health, appear to be susceptible to swelling of the glands of the neck from no ascertainable cause other than a constitutional tendency.

(*e*) *Tuberculous glands.*—Infection of the glands is a common manifestation of tuberculosis between the ages of three and adolescence. The infection may be produced either by bacilli swallowed with food or by bacilli inspired. The portal of entry *is the tonsil, which is particularly prone to invasion if it is enlarged, ragged, pitted, or the subject of recurrent inflammation.* In the same way, the resistance of the glandular tissues in the neck is lowered by chronic or recurrent inflammation. of non-tubercular origin and the path is laid open to tuberculous invasion.

It is a remarkable fact that at the hospital for sick children, Great Ormond Street, the operation for removal of tuberculous glands in the neck has become one of rarity since the introduction of the operation of complete enucleation of the tonsils.

As with tuberculosis elsewhere, the incidence of infection depends to a great degree on the general health of the child and he is rendered *more susceptible by debilitating diseases,* such as measles and whooping-cough.

Tuberculosis of the superficial glandular system almost invariably makes its appearance in the neck, extending as a chain of hard ovoid lumps down the anterior edge of the sterno-mastoid muscle. As the disease progresses, these glands become matted together, the inflammation extends to the glands of the posterior triangle and to those above and below the collar-bone and in the axilla.

Occasionally, the inflammation may subside in the early stage, but more frequently the glands become adherent to the skin, the substance of the gland breaks down, the skin over it becomes purple and finally gives way, resulting in a discharging sinus. Such sinuses may be multiple and persist for months or years before finally healing with unsightly scarring.

The condition is not as a rule dangerous to life, though generalised tuberculosis may result and occasionally the process may spread direct to the lungs. The glandular involvement is, however, at times only one manifestation of a widespread infection throughout the body.

(*f*) *Non-inflammatory swellings.*—Hodgkin's disease is a general enlargement of the lymphatic glands of the body, starting most commonly in the neck.

The glands reach a considerable size and in a case of some standing, the glands of the neck, axilla and groin will be found to be enlarged. The disease is intrinsically of the lymphatic system. Treatment is by increasing doses of arsenic and exposure to X-rays, but little hope of cure can be entertained.

(*g*) A second disease in which there is general enlargement of the lymphatic glands independent of inflammation is *lymphatic leukæmia.* This disease is, fortunately, rare in children. The disease is one of the blood-forming system and in the acute form of early life is accompanied by irregular fever, enlargement of the spleen and marked blood changes. The outlook is hopeless.

(*h*) *Glandular fever.*—A fever of unexplained origin occasionally occurs in India in the form of limited epidemics. The disease is characterised by the sudden appearance of groups of enlarged painful glands in the neck with fever. Usually the glands and fever subside after a few days, but the enlargement

may spread to glands elsewhere in the body causing some prolongation of the disease.

General diagnosis.

The main difficulty in diagnosis will lie in the distinction of tuberculous glands in the early stage. The first step will be to exclude all sources of chronic irritation of the type described in the preceding pages. The most persistent glands, suspected to be tuberculous, may subside when some source of irritation has been found and removed. Tuberculous glands tend to be oval in shape, matted together and adherent to the skin. If the mass is of any size, there is likely to be some breaking down area with dusky adherent skin over it. They are thus quite distinct from the glands of Hodgkin's disease which are more spherical in shape, are distinct from each other and not adherent to the skin and do not tend to break down whatever degree of swelling is attained.

Treatment.

The treatment of acutely inflamed glands consists firstly in an enquiry into the underlying condition and appropriate treatment of this. The glands are protected with a dry woollen dressing or better still with an application of antiphlogistine, but are not poulticed unless they are red, acutely inflamed and suppuration appears imminent. It is undesirable to encourage suppuration on account of the unsightly scar likely to be left. Should pus have formed, an incision is made, the pus evacuated and the wound dressed aseptically.

For chronic enlargement as well as acute, the first step will be to seek the cause. Such septic foci as chronically-infected tonsils or adenoids are removed as early as possible. Energetic treatment is desirable, for, as has been said above, such persistent glands are liable to be infected with tubercle bacilli.

Local applications in the form of mild counter-irritants, such as liniment of iodine, may be of value.

Attention is paid to the general health and tonics, preferably cod-liver oil and iron (No. 27 or No. 28) are given.

Treatment of tuberculous glands. Here again the possibility that the disease, if not caused, is at least exaggerated by some focus of infection must not be forgotten and the condition of the tonsils, nasal space, ears and teeth must be investigated and, if necessary, corrected. The child spends as much time as possible in the open air if the weather is favourable and an early change to the hills or to the seaside, according to season, is desirable. The diet must be carefully regulated and should contain an

ample supply of milk and fresh vegetables. Tonics in the form of iron and cod-liver oil are administered. The cod-liver oil is of special value, but care should be taken not to overdose the child. When available, a course of exposures to ultra-violet rays should be given or exposure to direct sunlight. The result of treatment by tuberculin is usually disappointing, but we have recently obtained encouraging results with V. A. V. Vaccine. The question of the removal of the glands by operation is likely to arise. The balance of opinion is that unless there are definite indications for removal, such as the breaking down of the glands or the formation of sinuses, operation procedures are best avoided.

SWELLING OF GLANDS OTHER THAN LYMPHATIC.

Inflammation of the salivary glands, the parotids and submaxillary, in its most typical form, is seen in mumps and the diagnosis affords no difficulty (*see* Chapter XXV). These glands are also liable to swelling and even suppuration in long-drawn out diseases of the bowel, notably typhoid fever and dysentery, when owing to stasis of the salivary secretion from want of stimulus by solid food, some form of bacillary infection is able to creep up the salivary duct from the mouth. For this reason, in all long illness and especially when the amount of fluid or food taken by the mouth is limited, the toilet of the mouth must be carried out with the greatest care.

Enlargement of the thyroid.—This enlargement, which will be manifest over or immediately on either side of the larynx, must not be mistaken for lymphatic enlargement. The causes of the enlargement are so diverse and some of them so important that expert advice should be sought at the earliest moment. It may be stated that in some young girls a functional enlargement takes place at about the age of ten, but has no significance and will pass off when puberty is attained.

CHAPTER XXVII.

DISEASES OF THE NERVOUS SYSTEM.

(For practitioners only.)

CEREBRO-SPINAL MENINGITIS.

Cerebro-spinal fever or the infantile variety, posterior basic meningitis, is an infectious disease often appearing in epidemic form, characterised by headache, fever and pain in the neck rapidly passing to a state of muscular rigidity and unconsciousness. The disease reappears annually in Calcutta in epidemic form being most prevalent in the winter.

The mode of transmission is uncertain, but our experience in Africa was that, by careful avoidance of overcrowding of infected communities, the incidence of the disease was curtailed. The symptoms of the disease are due to an intense purulent inflammation of the membranes of the brain, chiefly at the base, and over the spinal cord.

The onset is, as a rule, sudden, with fever, pain in the head, at the back of the neck and over the whole body and limbs. There is vomiting, frequent and often persistent throughout the disease, and convulsions. Stiffness at the back of the neck develops rapidly, any attempt to move the head forward induces severe pain which will cause even the semi-conscious patient to cry out. Gradually the head is drawn back, the limbs and trunk become rigid and in the most pronounced cases the head and spine arch so far backwards that the back of the head almost touches the spine. When the head retraction is not well marked, the general rigidity of the body may be elicited by drawing the head gently forward, when the thighs will be flexed on the abdomen (Brudzinski's sign).

A second sign, Kernig's sign, is of diagnostic value in meningitis of all types. This sign consists of the inability to straighten the leg at the knee, when the thigh is flexed at right angles to the body.

Bikele's sign. The arm cannot be extended above the head, owing to spasm.

The pupils in the early stages are affected, usually contracted, but in the later stages may become unequal. Squint also develops.

The pulse, at first increased in rate, will become slower as intracranial pressure becomes more marked. Again, later, if the case progresses, rapidity with irregularity of rhythm will supervene. The temperature is variable and exceedingly irregular, at times rising abruptly to 104° to 105°F. The respiration is irregular.

If the anterior fontanelle has not yet closed, it will be found to be bulging, a sign of increased pressure within the skull. Even during the state of apparent insensibility, the child cries out in pain. Convulsions not only usher in the attack, but may arise at any time in the course. Delirium may be violent and alternate with periods of loss of consciousness.

The commonest skin eruption in this disease is herpes, usually on the face, but there may also be a petechial rash on the neck and limbs.

Provided that the patient survives, the disease may last from two to four weeks in the active stage, to be followed by a prolonged period of convalescence with intervals of exacerbation and fever. The prospect of recovery, however, in young children is not hopeful, though, since the introduction of the serum treatment, the rate of mortality has been reduced.

The liability to complications in this disease is high, as the causative organism, the meningococcus, flourishes in other tissues with the production of inflammation, especially in the lungs leading to pneumonia and the joints leading to arthritis.

The after effects are severe, permanent deafness, blindness, disordered mental state and paralysis of muscle groups, especially of those around the spine. The inflammation at the base of the brain may result in the production of hydrocephalus.

The *treatment* falls under three heads:—

(1) Specific treatment. The introduction of anti-meningococcus serum intrathecally and intramuscularly. Since the introduction of the anti-meningococcus serum not only the mortality, but the severity and duration of the disease have been markedly reduced, though the mortality rate is still very high. The dose of serum for intrathecal introduction is from 5 to 20 c.c., the amount being fixed at some 5 c.c. less than the amount of cerebro-spinal fluid which escapes under pressure when lumbar puncture is performed. In addition 20 to 40 c.c. are administered intravenously or intramuscularly. The dose by both routes is repeated daily till the fever has subsided. In allowing fluid to escape the drainage should be carried on till the rate of flow is about one drop per second.

Lumbar puncture alone, with the withdrawal of the excess of fluid will prove of great value in lessening the intensity of the

coma, the violence of convulsions or delirium and the severity of the headache. Further, there is thus direct drainage of pus, organisms and toxins.

Where it is found that the fluid will not flow owing to some inflammatory block in the thecal space, a cisterna puncture may be possible.

(2) The control of spasms, convulsions, delirium and pain by sedatives and hypnotics, bromides and luminal or similar drugs of the barbitone group.

(3) The maintenance of nutrition. This may prove difficult as the patient will be unable to swallow. Recourse will be had to nasal feeding or the stomach tube.

Finally, it is important to realise that the disease is infectious and that the case should be isolated while those in attendance should wear gauze masks upon which are sprinkled a few drops of equal parts of eucalyptus oil and creosote, for infection enters the body through the mucous membrane of the nose. They should use some antiseptic nasal irrigations as a prophylactic measure.

PNEUMOCOCCAL MENINGITIS.

Meningitis may develop during the course of an acute disease most commonly pneumonia, and is caused by the organism of the primary disease. The nature of the infection will then be suggested by the nature of the primary disease.

MENINGISMUS.

Meningismus is a condition in which the signs and symptoms strongly suggest the onset of meningitis. However, the organic basis of such symptoms is but slight, being of the nature of congestion or increase of the cerebro-spinal fluid, rather than of inflammation, and the outlook, apart from the gravity of the general condition, is good. Such a condition may arise in the course of acute febrile disease and is a common complication of typhoid fever in children. If severe, a lumbar puncture should be performed as it will relieve the pressure and confirm the diagnosis from meningitis. The fluid will be found to be under pressure but clear and colourless. Meningism is also seen in the severe wasting diseases of children and in this country may be due to the poisons produced by worms within the bowel.

Provided that the general condition improves, the symptoms are likely to pass off leaving no trace.

TUBERCULOUS MENINGITIS.

Tuberculous meningitis is one of those disasters which occasionally befall young children. Its occurrence is exceptional

before the age of six months but after that age till the age of five there appears a tendency for tuberculous infection to take this form. Consequently, the young child must be most carefully guarded against infection, for once this form of the disease is contracted, there is no hope of recovery. Not infrequently there is a history of previous debilitating disease, especially measles or whooping-cough, or of a fall.

There are two sources of infection, the first direct from a human subject of tuberculosis, the second, the unboiled milk of tuberculous cattle.

The disease occurs either alone, arises in the course of a generalised infection or follows the infection of glands elsewhere.

The *course of the disease* may be divided into three stages:—

(*a*) The stage of onset.
(*b*) Of brain irritation.
(*c*) Of paralysis.

The onset is gradual, the child shows signs of being unwell, has no desire to play, is peevish and fretful, complains of head-ache or puts the hand to the head. In young children the head-ache will be indicated by a continuous puckering of the forehead and a strained look in the face. The temperature may be raised to 101° to 102°F., the pulse rate accelerated.

Within a few days the symptoms become more marked, the child is drowsy, prefers to be left alone and the headache becomes more persistent. To the other symptoms vomiting is now added and is of the cranial type, that is to say, has no relation to meals, is of sudden occurrence and is not preceded by nausea or warning. The child may vomit two, three or more times a day. *With the vomiting is associated obstinate constipation,* a combination of symptoms so unusual as to be suggestive.

After some ten days the intracranial pressure is raised to such a degree that the stage of irritation is produced. The fontanelle, if open, will be found to be bulging. The drowsiness increases, the child lies on the side, curled up and turned away from the light. He shows active dislike to any light or to interference. The pain in the head is intense and there is apt to be a monotonous toneless cry, the "meningeal cry". Convulsions are not infrequent. At this stage the pupils are dilated and unequal, and the abdomen, having lost the natural rounded outline of childhood, is retracted and hollow. The neck is stiff and resistant to movement, but rarely shows the retraction so characteristic of posterior basic meningitis. There may now be signs of paralysis, drooping of the eyelids or squint.

With the increasing intracranial pressure, the pulse becomes slower, more irregular and the respiration also is irregular.

The child is now completely unconscious; instead of lying curled up on the side, he now lies flat on the back, indifferent to his surroundings. One or more limbs may be rigid or show convulsive movements which may become general; the face is dusky, the respiration irregular with perceptible pauses and the pulse becomes more rapid and weak till finally it fails.

The total duration of the disease is about three weeks.

During the first few days *diagnosis* will be difficult, but later certain signs of grave intracranial mischief will develop. These are:—The severe and persistent headache, with "meningeal cry", unnatural drowsiness, slowing pulse and vomiting of the cranial type associated with constipation. Brudzinski and Kernig's sign as described under the section on cerebro-spinal fever, may be present, but these signs often appear at a late stage, when the diagnosis has become obvious.

Cerebro-spinal fever will be distinguished by the more rapid onset, the more pronounced stiffness of the neck and head retraction and possibly by the presence of a rash. Tuberculous enlargement of glands, most commonly those of the peritoneum, will point to the nature of the infection.

When arising in the course of a generalised tuberculous infection, it is likely that the cerebral symptoms will be masked by others, pneumonic or typhoidal.

Lastly, it should be mentioned that symptoms strongly suggestive of tuberculous meningitis may be seen during a severe gastro-intestinal disorder. Such symptoms may be more properly ascribed to meningism (described in the previous section).

Treatment.

Though attempts are made to retard the progress of the disease by the administration of hexamine, which we know has an antiseptic action in the cerebro-spinal fluid, treatment in general is directed to the mitigation of the distressing condition to which the disease leads.

The patient is kept in a quiet darkened room, with ice bags or evaporating lotion applied to the head.

Phenacetin grains two to four according to age, with caffeine in the proportion of a quarter grain to each grain of phenacetin, is given for the relief of headache. When there is restlessness, spasms or convulsions, chloral and bromides are given in doses as for convulsions.

Constipation which is obstinate is treated with calomel and enemata.

The drawing off of the excess of the cerebro-spinal fluid by means of a lumbar puncture will be effective in quietening the spasms and relieving to some degree the headache. The process may be repeated as often as necessary.

Lumbar puncture may also be performed for diagnostic purposes, the fluid being characteristic both microscopically and in certain chemical reactions.

Treatment by tuberculin has proved of no value.

ENCEPHALITIS LETHARGICA.

Encephalitis lethargica is a febrile disease of the brain leading to widespread derangement of the motor, sensory and mental functions.

The symptoms are so varied both in character and combination that space does not permit of more than in a brief outline.

The disease is by no means rare in India and it is possible that, in view of the attention which the disease has attracted in recent years, more cases will be identified. The disease appears to attack adolescents and adults more commonly than children. In Europe, the disease as a rule appears in limited outbreaks, and is considered to be infectious though to a minor degree. Though the number of cases recorded is increasing, there is reason to believe that the virulence is diminishing. Some authorities consider, in view of the tendency of the disease to appear during influenza epidemics, that there is some relationship between the two.

The initial stage is subject to wide variation; it may be of such severity as to produce a fatal issue, or it may be so slight that the disease is taken for a mild attack of influenza and the diagnosis is only made some months after, when the residual symptoms have developed. This *initial stage*, therefore, may be :—

(*a*) Acute with pronounced mental and constitutional disturbance.

(*b*) Sub-acute with or without distinctive symptoms, or

(*c*) Transient with a period of apparently normal health before further symptoms develop.

The common initial symptoms are :—Fever 101° to 102°F., profound weakness, lethargy, paralysis of one or more muscles of the eye leading to squint and double vision. Other symptoms of importance are hiccough, sometimes persisting for days, vomiting, giddiness and muscular pains.

With the acute onset the fever is higher, 103°F. or more, prostration is profound and there are signs pointing to a general

involvement of the nervous system. These are grouped as follows :—

General	..	Convulsions—mania—delirium.
		Lethargy or profound impenetrable stupor.
Local	..	Twitching—spasm—rigidity of the limbs.
		Severe muscular pains.
		Paralysis, most commonly of the muscles of the face or eyes.

Though the mortality in the more acute cases is high, from ten to twenty per cent., the importance of the disease lies equally in the residual symptoms. These symptoms can hardly be called after effects as they may either continue, having developed during the acute stage, or they may arise some time after the disease has apparently passed off and continue to increase in gravity for an almost indefinite period. However mild the initial stage may be, there is always a danger that sooner or later some of the more formidable residual symptoms will develop.

Age appears to play an important part in the nature of the residua. In children the commoner manifestations are:—

(*a*) Nocturnal restlessness, the child will not sleep at night, moves about, sings and talks. There is no actual shortage of sleep as the due amount is made up during the day.

(*b*) Alteration of mental and moral character. The child becomes acutely restless, impulsive and impatient of control. He may commit criminal acts of violence or thieving, but is aware of the nature of such offences and will, if suitably handled, express regret. On the other hand, if roughly handled or scolded, he may respond with uncontrollable temper or violence. The condition, in fact, resembles some degree of mania.

(*c*) Motor symptoms. These consist of tremors, there may be movements of the face, trunk and limbs resembling chorea or more pronounced slow weaving movements. Finally, one limb may be affected by regular jerking movements. Such movements may affect the muscles of respiration. Technically these movements are termed choreiform, athetoid and myoclonic. In older children and adults a common development is the Parkinsonian syndrome.

The outstanding features of this condition are :—The mask-like expressionless face, the constant tremor of the limbs, the sloth of all movements, the toneless voice, the bowed shoulders and forward carriage of the body. Not infrequently combined with this there is some degree of hemiplegia.

After the acute stage is passed, the outlook is briefly as follows :—A certain proportion of cases, especially those with

mild initial symptoms, do not develop residual symptoms, but recover completely.

Of those developing residual symptoms, a certain number will gradually recover. The outlook is better in those cases showing motor symptoms than in those showing mental change or Parkinsonism. The latter have shown definite improvement under large doses of belladonna and hyoscyamus. Hyoscine and stramonium may also be tried.

Treatment.—The treatment in the acute stage is mainly that of any acute febrile disease. High feeding is very necessary on account of the restlessness and activity of many patients. Warm baths or hot packs may do much to control this restlessness. Medicinal treatment consists in the administration of iodine or hexamine, but is unsatisfactory.

Prolonged rest, bodily and mental, is necessary after the mildest case and will do much to influence favourably the ultimate outlook.

The later treatment is mainly re-educational.

INFANTILE PARALYSIS, ACUTE POLIO-ENCEPHALITIS.

This disease has been brought into undesirable prominence during the last few years, by the occurrence of a number of widespread epidemics in Europe, America and Australia. The disease is uncommon in India. Epidemics have not been recorded in India, but sporadic cases, though seldom seen in the acute stage, are not uncommon.

Infantile paralysis is definitely infectious, though a high proportion of the population appears to be immune. Infection takes place by direct transmission though the disease may be carried and passed on by healthy or immune persons. The highest proportion of cases occur during the second year of life (Still) though children of all ages are affected and adults do not escape. The incubation period is from four to seven days and the patient is regarded as infectious for fourteen days after the onset of the attack.

The characteristic feature of the disease is the development of paralysis, which may be the first sign, or which may be noticed in the early days of the feverish onset. The onset is abrupt, with fever, vomiting, possibly convulsions and catarrh of the nasal and bronchial passages. There is a pain at the back of the neck and the onset of paralysis is signalised by marked tenderness of the limbs affected. At once or after a variable period, it is noticed that one or more limbs lie slack and useless. Such paralyses are not due to any condition in the limbs or muscles

themselves, but are produced by change, temporary or permanent, in the nerve centres in the spinal cord which control and activate the muscles. The paralysis, which may at first be extensive, involving the whole of one or more limbs, is not commonly symmetrical, and does not, as a rule, affect the muscles of the trunk.

The fever and general symptoms last for a short period up to seven or ten days, followed by a quiescent stage of some weeks during which there is no advance of paralysis; on the contrary, many of the muscles, at first paralysed, regain their power, but those in which the paralysis has become fixed, show marked wasting.

The third or final stage is marked only by changes in the paralysed muscles, improvement in some cases, deterioration in others, leading to deformities of which some form of club-foot is the most common, or there may be marked re-acquisition of power not so much by the recovery of muscles as by a process of compensation by which the child learns to use the sound muscles to the best advantage.

A more serious variety of the disease, in which the nerve centres of the brain are affected, is seen more commonly in epidemic rather than sporadic cases. In this form, evidence of damage to these nerve centres is seen in the development of paralysis of the muscles of the face, of respiration, of swallowing and in a rapidity of the pulse rate due to loss of the nerve control of the heart.

The prospects are far brighter than would at first appear, whole limbs, apparently completely paralysed, may recover their power or the residual paralysis gradually fine down to one group of muscles; indeed, cases have been recorded where complete recovery has taken place.

Treatment.

In the acute stage, large doses of hexamine combined with sodium bicarbonate are given with the object of limiting the infection. Owing to variations in individual toleration the dose cannot be fixed definitely, but, in view of the urgency, a toxic reaction must be risked. It is advisable to start with five grains four-hourly, decreasing if necessary, but increasing to two-hourly doses if the drug is well borne. Alternatively, to produce a more rapid or direct effect, hexamine may be administered intravenously.

During the quiescent stage, iodides have been given with advantage and recently X-ray treatment to the spine has been advocated. This stage must be regarded as a conservative stage,

the nerves and muscles must be given time to rest and recover, but their nutrition must be maintained and the development of deformity prevented by the use of gentle massage and, if necessary, splinting.

The treatment of the last stage, which may be continued up to three years with hope of improvement, consists of more vigorous massage, preferably twice daily and, if available, electric treatment. The child is encouraged to use the weakened limb, but care should be taken that the unopposed sound muscles do not damage the weakened ones or increase deformity by over-action. It must be remembered, at this stage, that such paralysis as remains is due to damage to nerve centres and that no treatment to the muscles will restore the power, but contraction for stretching of muscles leading to deformity will be prevented, border-line or partially paralysed muscles will be improved and the growth of the limb, which tends to be less than that on the sound side, will be encouraged.

The following directions to mothers for the care of paralysed limbs are issued at the Hospital for Sick Children, Great Ormond Street :

LOWER LIMBS—CLOTHING.—They must be kept warm day and night. Knitted woollen stockings to come up above the knees. If these do not keep the limbs warm, woollen overalls to be worn outside the stockings. The overalls to come up the thighs. If these are not sufficient to keep the limbs warm, the overalls must be lined with cotton wadding, which is to be quilted so as to hold fast to the overalls. For the night a flannel sack, made in the shape of the leg and coming up to the top of the thigh, is the best. This sock should be lined with cotton wadding.

RUBBING.—For a quarter of an hour twice daily. Set the child on a chair, or lay it on the bed, or let it sit on somebody's knee.

1. Rub the paralysed leg from the foot to the top of the thigh. Rub upwards only. Put the broad part of your hand on the back of the child's leg. In rubbing the thigh, you may put your hands, first on the back of the child's thigh, and afterwards on the front of its thigh. But always rub upwards, and be sure to go as high as the child's loins. Whilst rubbing with your right hand, hold the child's foot with your left. Use for rubbing any kind of oil.

2. Take hold of the child's leg just above the ankle, with your two hands. Rub round the leg with your two hands in the opposite direction, as though you were wringing out sheets. Work up the leg and thigh, from the foot up to the top of the thigh, in the manner described.

3. Take the child's calf with your two hands. Put your fingers to the back of the leg and your thumbs to the front, squeeze the soft parts out between your fingers and thumbs, so as to flatten the leg and make it as wide as possible. Work right up the leg and thigh in this manner.

4. Put your right hand over the front of the child's knee. Put your left hand against the child's foot. Push up the child's foot, and holding your right hand in front of the child's knee you will prevent yourself doing any harm. You want, if possible, by pushing the child's foot, to make the child push against your left hand with all its might. *This is the most important of all the exercises.*

5. Flip every part of the leg and thigh with your fingers, so as to make the whole of the limb quite red and warm.

6. Gently rub up and down all over. This will take the stinging away which was left by the last movement.

BATHS.—Once a day let a large jugful of hot water, containing two handfuls of salt, be poured down the leg and thigh. Then pour half the quantity of cold water over the leg and thigh. Then rub thoroughly dry with a towel, and continue to rub until the limb is perfectly warm. *Mutatis mutandis*, the directions apply equally, of course, to the upper limb when that is paralysed.

FALSE PARALYSIS.

Such a condition of true paralysis must not be confounded with those cases of false paralysis not infrequently seen, in which the limb is immobile and apparently powerless not from inability but from inhibition from movement owing to the pain it entails. The following are the commonest causes of such false or pseudo-paralysis :—

(1) Congenital syphilis in very young children in whom there is inflammation at the ends of the bones of the limbs. Such cases react rapidly to mercurial treatment.

(2) Infantile scurvy; a disease of babies up to the age of two, rarely in older children, whose diet has been deficient in the antiscorbutic vitamin C, that is, babies fed entirely on patent foods and tinned milks without the addition of fresh fruit juice. In such cases, the limb or limbs are excessively tender, the child screams if handled and develops a somewhat characteristic anxious look when approached. The lesions of scurvy are produced by hæmorrhage, under the membranes of long bones, at the rib ends, from the gums, under the skin so that bruises are formed without injury (Chapter XX), and from the kidneys, so that the urine is tinged red.

(3) In older children one to three years, rickets, rheumatism, mental deficiency may be causes, and it is well not to forget that surgical conditions such as congenital dislocation of the hip may be responsible for the inability to walk. In the event of any such disability, professional advice should be sought early.

TETANUS.

This disease, though rare among Europeans, merits a short description on account of the alarm and sense of helplessness which its occurrence will occasion. Among the children of Indians the disease is, unfortunately, very common and it is one of the many causes of the terrible infant mortality of Calcutta.

The disease commonly occurs between the third and tenth days of life, being at this time due to infection of the raw surface of the umbilicus by the tetanus bacillus, which flourishes

in the dirt and dust of crowded cities and especially where there is much litter of horse-dung.

Tetanus, however, is not confined to early infancy, as the records of any big Indian hospital will show. The disease attacks all ages and the writer has seen victims aged from five days to sixty years.

Among children a common site of infection is the ear, superadded to an older infection such as is seen in the common discharge from the ear. The site may also be in any wound or cut into which dirt or dust has been introduced.

Though the disease runs a rapid course, there are always premonitory symptoms. In the infant, these will take the form of restlessness, whimpering, broken sleep, yawning and hasty snatches at the mother's breast, which, however, the infant soon relinquishes. Probably the first matter to attract the attention of the mother will be the inability on the part of the infant to take the breast, an inability which the mother may attribute to some fault of her nipple, unless she happens to examine the child's jaws which will be found to be stiff and opened with difficulty.

After a few hours the jaws become fixed and the features undergo a characteristic alteration; the lips are drawn tightly over the gums, the corners of the mouth are pulled down and the eyes are half shut. This stiffness extends rapidly to the limbs and trunk, the hands are clenched and the head and spine are arched backwards. Swallowing is difficult or impossible. At intervals, the length of which vary with the severity of the case, waves of contraction or spasm pass through the whole body. During such attacks the pain is intense, respiration is interrupted by reason of the spasm of the respiratory muscles and suffocation appears imminent. The spasms are induced by the slightest cause, such as a draught of air or a movement of the bed-clothes, but also arise independently of external stimuli. The child remains conscious throughout the course of the disease.

In older children, the features of the attack are in no way different; with the onset the child complains of stiffness of the neck, jaws and difficulty in swallowing.

Fever is present from the onset and, in the more severe cases, will remain at 103° to 104°F. or even higher.

Treatment.

The outlook in all cases of tetanus is bad, especially so in the very young. Among older children good results have been obtained with a line of treatment to be described. Treatment must be both general and local, at the site of the infection.

Wounds must be opened up if necessary and treated antiseptically to prevent the production of more poison. The infected navel must be carefully cleansed and dressed with antiseptics.

The aim of general treatment will be threefold :

(*a*) To ward off spasms and ensure rest.
(*b*) To maintain nutrition and combat exhaustion.
(*c*) To neutralise the poison with anti-tetanic serum.

The patient must be kept in a darkened quiet room, and handled as little as possible in order to avoid exciting the spasms.

The following is the routine of the Medical College Hospital, Calcutta :—

Morphia at once. To children over five years of age, grain 1|6th to 1|12th; under five, grain 1|8th to 1|16th; under three years, proportionately less.

Potassium bromide and chloral. Over five, of each grains 10; under five, of each grains 5; given in solution by the rectum two-hourly; under three years, proportionately less.

Antitoxin.—Intravenous 3,000 units or intrathecal 1,500 units, followed by a daily dose by the intravenous route of 1,500 units till the spasms cease.

Magnesium sulphate 25 to 50 per cent. 1 c.c. hypodermically or intravenously daily; or

Acid carbolic 2 per cent. 1 c.c. as above.

Magnesium sulphate is also given in big doses by the mouth and in enemata.

Feeding will present great difficulties and recourse must be had to the nasal tube. It may be necessary to administer chloroform in order to make this manœuvre possible. Hope of recovery depends largely on the day of the disease at which treatment is commenced.

In tropical countries where the disease is prevalent, special care must be directed to the cleansing and treatment of all wounds however trivial. When abrasions to any extent or depth have been sustained by such accidents as involved the soiling of the wound by the dirt of frequented roads, in addition to thorough cleansing with some such antiseptic as iodine, a preventive inoculation of the anti-tetanic serum is desirable. The dose is 1,500 units.

The tetanus of infancy is preventable if due care and cleanliness is exercised in the dressing of the navel string.

CHAPTER XXVIII.

DISEASES OF THE MOUTH, THROAT, NOSE AND EAR.

Thrush is one of those affections of early infancy (rare after the third month, except during the first dentition) which *ought never to occur, and which will not occur in a well-managed infant.* It is a disease of mismanagement, which is characterised by little white patches within the mouth. In itself it is a trivial complaint, though it is indicative of a deranged state of the digestive organs, unfavourable to assimilation.

The chief cause of thrush is an unsuitable diet, which, producing a disordered state of the system, originates an unhealthy condition of the mucous membrane of the mouth, and renders it a fitting soil for the lodgment and growth of a peculiar vegetable parasite. This parasite belongs to the yeast group, and is closely allied to, or identical with, that which exists in sour milk. The parasite thus suitably planted, there develops and causes spots of inflammation which present the appearances known as "thrush".

A dirty, sour state of the feeding-bottle or its nipple will also nourish the parasite, which may thus become lodged in the child's mouth. The contagion may also be conveyed from one child to another by means of bottle nipples, comforters (chusni), spoons and such articles unless care be taken to keep them scrupulously clean.

The affection is particularly common in the hot weather, which favours the growth of the fungus.

At first there is merely redness and some tenderness inside the mouth, which, if carefully examined, will show numerous very minute transparent blebs. These (spots of lodgment of the parasite) inflame, burst, and form white specks, each perhaps only the size of the head of a pin. The interior of the mouth now becomes angry-looking. It is at this stage that the affection, usually for the first time, attracts the attention of the mother or nurse. The size of the patches next slightly increases, presenting an appearance as though minute portions of curd adhered to the inside of the cheek or lips; but it will be found that they cannot be moved about as could mere particles of food; nor can they be dislodged without some slight force, and if removed, they leave behind little ulcers, which bleed slightly.

Near the corners of the mouth, the inside of the lips, and the under surface of the tongue are the most frequent situations; but the spots may extend over the roof and back of the mouth, even to the tonsils and throat.

The condition is often accompanied by acid diarrhœa leading to considerable irritation of the buttocks. The reaction of the saliva is acid, favouring the growth of the fungus. Thrush seldom occurs in the healthy infant, as the normal mucous membrane inhibits its growth.

Thorough cleanliness is the first essential. After each meal the mouth should be washed out with a little warm water to which is added bicarbonate of soda grains ten to the ounce. The action of the bowels should be regulated, the diet balanced and a stomachic mixture No. 13 given. The child must be fed frequently, because the efforts at sucking may be so painful as to interfere with nutrition, and after each meal his mouth should be swabbed out with a piece of soft rag moistened with warm water.

The next thing to be done is to destroy the parasite. This is easily accomplished by the application of borax and glycerine within the mouth after each swabbing. Another capital application is the hyposulphite of soda (one drachm to one ounce of water), which very quickly destroys the vegetation.

When the mouth is extensively affected, particularly if the throat be involved, it will be desirable to give a mixture of chlorate of potash grains 2 to the teaspoonful of dill water or prescription No. 31.

Good hygienic surroundings and a carefully regulated diet are essential.

A mother who is suckling an infant affected with thrush is apt to suffer from sore nipples. She should, therefore, carefully wash her nipples with borax and water after each nursing, and then paint them with equal parts of Eau de Cologne and Glycerine.

The application for thrush :

Take	Borax	.. ..	½ drachm
	Glycerine	.. ..	1 drachm
	Water to	.. ..	1 oz.

Apply after each swabbing of the mouth.

Aphthous ulceration.

Aphthous ulceration somewhat resembles thrush in appearance but appears at a later age. The ulcers appear as yellowish patches, commonly on the inner surfaces of the lips and on the

edges of the tongue. They are painful to touch and interfere with feeding.

Treatment is by simple mouth washes such as 10 per cent. boracic lotion and attention to the general health.

Catarrhal stomatitis.

At times, through want of care, through rough cleansing the child's mouth or during debilitating diseases the mouth and tongue may become reddened and tender. In such cases the mouth should be gently swabbed four or five times a day with the borax and glycerine lotion mentioned above.

Rarely more severe inflammation and ulceration of the mouth, tongue and gums may occur. In such cases the mouth should be washed out frequently with a weak solution of Condy's fluid (one drachm to eight ounces of water), with potassium chlorate grains ten to one ounce of water or with hydrogen peroxide.

The diet should consist of beef tea, milk, raw egg and milk, pounded meat and such nutritious articles as the child can be induced to take. All food is best given iced or cold. The bowels should be carefully regulated, neither constipation nor diarrhœa being permitted. Fresh fruit juice should always be given.

From the outset the potassium chlorate (mixture No. 31) should be administered and continued till convalescence is established. Potassium chlorate is to be regarded as a specific both for local and general use in all inflammatory or ulcerative conditions of the mouth.

During convalescence a tonic (No. 28 or No. 30) should be given till the strength is completely recovered. The occurrence of acute stomatitis should prompt an enquiry as to the presence of some severe constitutional disease such as leukæmia.

THE THROAT.

The portion of the throat which comes into view when the mouth is opened is the pharynx. Hanging down from the centre of the soft palate is the uvula, on each side of this two folds curve downwards to be attached to the base of the tongue. These folds are the pillars of the fauces. Tucked in between the pillars of the fauces are situated the tonsils. On the back wall of the pharynx will also be noticed small isolated pinkish elevations. These are collections of lymphoid tissue. Behind the tongue is the entrance to the larynx, a complicated cartilaginous structure in the interior of which are stretched the two vocal cords which are concerned with the production of the voice. The larynx as it proceeds downwards become continuous with the trachea or

windpipe and the branches of the trachea are known as the bronchi. These passages conduct air into the lungs. At the back of the larynx, the throat narrows into a tube which is continued downwards into the stomach. The tube is the œsophagus or gullet and serves for the passage of food into the stomach.

If the tongue is pressed firmly down with a spatula or the handle of a spoon, the pharynx comes into view, the soft palate, the uvula and on either side the tonsils are seen. If it is necessary to see the larynx, the tongue is gently drawn out with a tongue cloth, a small mirror is inserted into the mouth, the back of this kept firmly in contact with the uvula, a beam of reflected light is projected on to the surface of the mirror when the image of the interior of the larynx is seen. It is not always possible to perform this examination in a child owing to its nervousness, it then becomes necessary under a short anæsthetic to examine the larynx with a spatula with a light at the end of it. It is occasionally difficult to examine the throat, nose and ear of a refractory child and it becomes necessary to use some means of restraint. The following method is a good one. The child is seated on the lap of an attendant who imprisons the patient's legs in his. One arm of the attendant is then encircled around the child's body controlling both his arms. The other hand of the attendant steadies the patient's forehead firmly on his shoulder. If the child refuses to open his mouth, compressing the nostrils will soon make him open the mouth for air, when a spatula is quickly inserted into the mouth.

THE TONSILS.

The tonsils are collections of lymphoid tissue situated on either side of the throat. The surface of each tonsil is pitted, these pits are the mouths of the crypts. These are narrow blind tubes which extend through the entire thickness of the tonsil, their blind extremities resting on the capsule of the tonsil. There is one very large crypt situated at the upper end of the tonsil. The tonsil is supplied with one artery which enters it above and two veins which leave it and it rests in a bed surrounded by the muscles of the throat. The function of the tonsil is protective, it is the first line of defence against the onslaught of micro-organisms, but this function is such a very weak one that it is easily disturbed in favour of the organism. When this happens the tonsil instead of being a protection becomes a point of entry of germs of disease and their poisons into the system. The first and earliest sign which gives us an indication of the failure of the tonsil is an enlargement of the glands on either side of the neck. The tonsil, however, makes a fight to regain its function and does this by

becoming enlarged or hypertrophied. The effect is not usually successful, for the glands in the neck do not subside and in many instances grow larger and sometimes break down. An enlarged tonsil is therefore nearly always a diseased tonsil. The tonsil does not always enlarge when it is diseased, frequently a small tonsil is found on examination to have its crypts particularly the large one at the top full of very foul pus. The absorption of this pus into the system is responsible not only for the general ill health it produces in many individuals, but also distant diseases in many parts of the body.

The tonsils may be the seat of an acute or a chronic inflammation.

Acute tonsillitis.

In a child the period of election for sore throats is during the first dentition and particularly when the milk teeth are beginning to decay and to be shed. These carious teeth form a powerful source of infection. The infection of the tonsil, apart from those cases in which a tonsillitis is part of an acute fever such as scarlet fever or measles, is a surface infection. A scratch or abrasion from hard morsels of food may provide the portal of admission of the numerous germs of which the mouth is full. This may not however be sufficient cause for an acute inflammation, the determining factor always is the virulence of the germ together with the presence of those obscure conditions which produce a lowered resistance in the patient. The commonest organism responsible for acute tonsillitis is the streptococcus pyogenes. The infection is spread by individual to individual, in this way is to be explained outbreaks of this disease in schools and institutions. Acute tonsillitis also occurs during the acute fevers such as measles, scarlet fever and diphtheria. The attacks are usually recurrent and it is common for the healthy tonsil to be infected as soon as the infection begins to subside in its fellow.

When the brunt of the inflammation falls upon the crypts, the products of inflammation appear at the mouth of these crypts and are seen as whitish or yellowish spots or patches which may coalesce, but do not spread beyond the tonsil. The surrounding tissues are swollen and congested. Such a tonsillitis is known as acute lacunar or follicular tonsillitis. When the severity of the inflammation falls upon the substance of the gland without particularly affecting the crypts, the condition is called an acute parenchymatous tonsillitis, the tonsil is here seen to be very swollen, red and angry. When the infection is a deep one and the micro-organisms penetrate through the crypts and reach beyond the capsule of the tonsil, we have the condition known as

peritonsillitis (inflammation around the tonsil). Such an inflammation may go on to abscess formation but rarely does so in early childhood. The pus collects between the capsule of the tonsil and its muscular bed. The abscess is called a peritonsillar abscess or quinsy. When the throat of a patient suffering from quinsy is examined, there is seen to be present a great swelling or bulging of the soft palate above and to the outer side of the tonsil which is often pushed down completely out of sight.

Two or three days before the onset of the attack there may be feelings of malaise, there is then a sudden rise of temperature which may be very high in children. There is pain in the throat on swallowing, the tongue is furred and the breath offensive. The glands in the neck below the angle of the jaw are enlarged. An acute attack usually subsides under treatment in four or five days.

A free purge should be given, a fever mixture containing salycilate of soda is very useful. Hot applications to the side of the neck and frequent hot gargles with a solution of permanganate of potash or glycothymolene are very useful in allaying the pain. Children as a rule are unable to gargle and in those that cannot the throat can be *gently* syringed out with the solutions mentioned above. Among the numerous paints in use none is so comforting as one containing carbolic acid which, in addition to being an efficient antiseptic, has also the properties of a local anæsthetic. The following formula is a good one:—

Resorcin	gr. xl.
Acid carbol.	m. viii.
Spt. menthæ pip.	m. xxv.
Glycerine to the ounce.	

In some instances the pain of an acute tonsillitis is so great that it is difficult to get much nourishment into the patient. It is often found that semi-solids such as custards, thick arrowroot or white of egg are more easily managed than liquids, and a good novelty and one that nearly always succeeds in a child, is to make it suck its food through a straw. When the acute attack subsides the child should be well nourished and tonics given.

An acute attack of tonsillitis is usually followed by another acute attack and these, whether they may be single or multiple, usually lead to tonsillar hypertrophy with an accompanying enlargement of the glands in the neck. It is not always necessary for hypertrophy to be preceded by an acute attack of tonsillitis. The presence of sources of infection such as decayed teeth, adenoids, etc., are quite sufficient in themselves to produce an hypertrophy.

Often the tonsils do not enlarge appreciably; yet they are on careful examination seen to be infected and the crypts being full of foul-smelling septic material.

Chronic fibrotic tonsils are not often seen in children. These are small pale firm tonsils, repeated attacks of inflammation having produced much fibrous tissue the contraction of which leads to cystic dilations of the crypts, with the retention of pus in these cysts.

The results of chronic infected tonsils are :—

I. The tonsils may be so large as to cause a mechanical obstruction to respiration and deglutition.

II. Being diseased, they make the patient more liable to repeated attacks of sore throats.

III. They may in children especially cause an obscure pyrexia and general ill health from the absorption of toxins into the system.

IV. They may affect the ears.

V. They may act as the gateway of infection and give rise to such conditions as tuberculosis (especially of the glands of the neck), rheumatic fever, rheumatism, endocarditis, pericarditis, pleurisy, nephritis, chorea, etc.

The treatment of chronic tonsillitis by paints and surface applications is most unsuccessful, the reason being that the tonsil is riddled right down to its capsule with crypts and an application therefore made to its surface seldom reaches to the bottom of the crypts in which infection lies hidden. The radical treatment is the removal of the tonsil by operation.

Every symptom enumerated above is an indication for the complete removal of the tonsils by enucleation.

Parents often object to the operation on the grounds firstly that the tonsils will grow again and secondly that post-operative hæmorrhage is in every case alarming. They are sometimes also heard to say that the tonsils have a function and that therefore they should not be removed. As regards the first, it may be said that they will not grow again if the modern operation of enucleation is carried out. As regards the second, the improvements in technique and in methods of control of bleeding are so perfect nowadays that no case need ever be lost from hæmorrhage unless the operating surgeon is so unfortunate as to strike a bleeder. The risks of troublesome but not uncontrollable hæmorrhage are present in an adult with fibrotic adherent tonsils, but such risks are almost nil in a child. As regards the third objection, the

defensive function of tonsil is a weak one and easily lost by disease; when this happens, the tonsils become a source of septic absorption and for this reason have to be removed.

For the distinction between acute follicular tonsillitis and diphtheria, the reader is referred to Chapter XXV.

THE LARYNX.

Colds in the head and all causes predisposing to this condition such as obstructions to nasal respiration, adenoids, etc., are the commonest causes of acute laryngitis. The infection starting in the nose or nasopharynx spreads downwards and attacks the larynx. All the infective fevers such as measles, whooping-cough, influenza, scarlet fever, etc., being associated with infections of the upper respiratory tract are particularly prone to lead to the condition. There are other causes such as injuries, inhalation of irritant vapours, etc., but the above are the commonest causes in children. Acute inflammation of the larynx is always a serious condition in children. Because of its small size, the larynx is very easily obstructed by small amounts of inflammatory effusion producing difficulty in breathing and spasm.

(For further description of croup and allied conditions of the larynx, *see* Chapter XIV).

Foreign bodies in the air and food passages.

In children the commonest foreign bodies met with are pieces of meat, fish bones, seeds, fruit stones, nuts, needles, pins and coins and beads. All these varieties of foreign bodies may pass into the food and air passages and become impacted. If they are not removed, the consequences are often serious.

A very large foreign body such as a piece of meat may lodge at the entrance to the larynx and cause a sudden obstruction to the airway. In such circumstances, in view of the urgency of the condition, a finger may be placed inside the throat and an attempt made to dislodge the foreign body. A smaller foreign body may be impacted above the vocal cords. In such a case an attempt should be made to remove it by means of a laryngeal mirror and suitable forceps. If the foreign body is impacted in any part of the bronchial tree and there is partial or complete obstruction to the airway beyond, the distal part of the lung collapses, micro-organisms invade this portion of the lung and an abscess results. In the bronchial tree the symptoms seem to depend more on the kind of foreign body; for instance, vegetable substances such as seeds, etc., cause an intense inflammation and produce a septic broncho-pneumonia. The right bronchus, owing to its larger size and its being in an almost direct line with the

trachea, is the one in which foreign bodies most often lodge. Foreign bodies lodged in the air passages are very dangerous. Methods of removal nowadays and the instruments for the purpose are so perfect that no time should be lost in coming to a centre where the intruder can be removed.

Foreign bodies may slip past the opening into the larynx, pass into the œsophagus and so through the alimentary canal without causing trouble. Sometimes they may lodge behind the larynx or at the opening of the œsophagus into the stomach. Such cases call for urgent expert assistance.

In all cases where a foreign body has been swallowed, emetics and purgatives should be strictly avoided.

THE NOSE.

Each nasal cavity is a chamber separated from its fellow of the opposite side by a partition partly bony and partly cartilaginous. This partition is called the septum of the nose. On the outer wall of the nose are three curved shell-like bones called the turbinate bones, each of these is covered with mucous membrane. The two upper ones have the nerve endings of the sense of smell and the lowest one—the inferior turbinate bone—the most important structure in the nose, warms, moistens and purifies the air and makes it ready for its reception into the lungs. The outer wall of the nose has also connected with it a system of large air cells whose function is to act as resonators for the voice. The nose opens behind into a space which is curtained off from the mouth by the soft palate. This space is called the post-nasal space. It is from here that adenoids grow.

The importance of a clear airway through the nose cannot be sufficiently emphasized. The air, during its passage through the nasal cavities is rid of impurities, is warmed when necessary and moïstened. The results of an imperfect airway are discussed under the heading "adenoids".

To examine the front part of the nose, the child should be taken to a good light and the nostril tilted up when the front part of the septum and the ends of the inferior turbinate bone come into view. It is generally, however, necessary to examine the deeper portions, a small nasal speculum or a large sized ear speculum is inserted within the nostrils and with the aid of a head mirror a beam of light is projected into the nose when the deeper parts are seen. A post-nasal examination must always be made in a child. It is seldom possible to perform this in the ideal way, that is, by inspection with a mirror. A digital examination has to be made and it is to be done in the following manner. The observer stands to the right side of the patient, he

puts his left arm over the patient's head and having asked the child to open its mouth, the left forefinger pushes the cheek gently between the upper and lower teeth to prevent the child from biting the examiner's finger. The right forefinger is swept in underneath the soft palate into the post-nasal space where any abnormality such as adenoids are felt for.

The best way to cleanse the nose is to blow it. Older children can usually be taught to blow their noses. It is not sufficient simply to wipe the nostrils. For cleansing purposes watery solutions have to be used, the best solution is an alkaline one, and the following formula is a good one :—

Sod. bicarb.	..	
Sod. chloride	..	aa. grs. iii.
Borax	..	
Acid carbolic	..	m. ½.
White sugar	..	grs. v.
Water	..	to the ounce

This solution may be dropped or gently squirted into the nose by means of an ordinary fountain pen filler or poured in by means of a glass nasal douche or sprayed into the nostrils with a spray.

Owing to its prominent and exposed position, falls on the face are particularly liable to *fracture* the nose. It may be taken as a general rule that whenever a child after a fall upon its face has bleeding from the nose, it has sustained a fracture either of the nasal bone or the cartilaginous portion of the septum. These injuries should be attended to with care by a surgeon, because the former can produce an unsightly deformity and the latter may cause nasal obstruction by producing a twist of the septum.

Children are apt to insert *foreign bodies* into the nose. In Indian children, the commonest foreign body met with in the nose is the tamarind seed and portions of areca-nut. Buttons and beads are also encountered. When seen early, these foreign bodies are seldom deep in the nose, they can be extracted with the greatest ease by means of a long bent probe. The bend of the probe is got beyond the foreign body and on withdrawal of the probe, the body comes away. It is seldom necessary to use a pair of forceps for the extraction of a foreign body. If one is used, its blades should clearly be seen to grasp the foreign body. An object left in the nose for any length of time gives rise to septic complications. A purulent foul smelling and bloody discharge from one nostril is nearly always indicative of a long-standing and neglected foreign body in the nose of a child.

Nose bleeding is common in children. In nearly every case the bleeding comes from a vessel situated on the front part of the septum and within easy sight of the surgeon's eye. The simplest way to control the bleeding is to tightly hold the nose between the finger and the thumb for a few minutes. It is hardly ever necessary to do anything so drastic as to plug or pack the nose, this practice is much to be deprecated owing to the serious consequences which may follow. Should the bleeding persist, a small pledget of cotton-wool moistened with adrenalin or peroxide of hydrogen inserted just within the affected nostril for a short time is sufficient to arrest the bleeding. Cold applications on the bridge of the nose are also very useful. Epistaxis is common in children suffering from adenoids. It frequently also is the first sign of an acute fever, such as measles or pneumonia. Frequent and persistent attacks of epistaxis should always lead to a careful examination by a specialist.

Children are more apt to suffer from *colds in the head* than adults, whilst the condition is a trivial matter in an adult, it often is quite a serious affair in a child. The reason of this is that a cold is more liable to spread downwards and affect the bronchial tubes in children. Colds are invariably caused by infection with micro-organisms and are to be regarded as infectious fevers just like measles. When a child, however, suffers from repeated attacks of cold, the probabilities are that there is some obstruction to nasal respiration which causes that particular nose to be an ill-drained cavity, and therefore more susceptible to the attacks of micro-organisms than healthy unobstructed noses. The commonest obstruction to nasal respiration in a child is adenoids, and children with adenoids are apt to suffer from more or less perpetual colds. Prevention of colds is better than cure. No one suffering from a cold in the head ought to be allowed anywhere near children. Fresh air is of prime importance, but the rules of hygiene such as baths, exercise and suitable clothing should receive adequate attention. A child who catches cold should be treated in bed and isolated from other children. Such household remedies as hot gruel, mustard baths and a purge may abort an attack. Many remedies have been praised, among these may be mentioned vini ipecac., antimonial wine, cinnamon oil and ammoniated tincture of quinine. Care must be taken to graduate the doses of these to the age of the child (*see* also prescription No. 20).

Ozæna.—Most cases of this distressing disease begin between the ages of five and twelve. The child is brought by its parent who complains of the presence of a very foul-smelling purulent or crusty discharge sometimes blood-stained, which makes social

intercourse with the child intolerable. If a foreign body is not present, then the condition most probably is ozæna. The cause of this trouble is unknown and it is incurable. Much, however, can be done towards alleviation, one of the most successful treatments is to pack the nose for twenty minutes with ribbon gauze soaked in glycerine, the glycerine provokes a flow of mucus which loosens the crust which can then be syringed out. The treatment should be carried out every day over long periods.

ADENOIDS.

There is normally present a small collection of lymphoid tissue in the post-nasal space. When this tissue undergoes enlargement, the condition is popularly known as adenoids. The exact cause of this enlargement is unknown. In a few cases it is met with at birth or shortly afterwards, but usually the enlargement begins to appear from the age of three to ten. The tendency is for these growths to disappear as age advances, but this may not invariably be the rule. The enlargement causes an obstruction at the back of the nose to the passage of air into the lungs.

The symptoms can be described under several headings, of which the most important is the disturbance with normal function of the nose causing an obstruction to nasal respiration. The commonest signs in a typical case are these. The mouth is open and the upper teeth project. The nose is pinched up from want of use. The mouth being open, the cheeks are dragged upon causing an obliteration of the natural folds. The face on this account acquires a dull, vacant and expressionless appearance. In a marked case there is a constant discharge from the nostrils leading to excoriation of the surrounding skin. The child breathes heavily in the day and snores at night. He gets out of breath easily and complains much of thirst owing to the dryness of the throat occasioned by mouth breathing. He takes hours over his food, frequently having to give up eating in order to take a mouthful of air, a young infant on the breast chokes owing to its inability to suck and breathe through the mouth at the same time. The voice is dead and toneless. Bleeding from these growths often cause epistaxis.

Owing to adenoid obstruction, the lungs cannot expand sufficiently and the chest is flattened. In those cases where there is an element of rickets, the typical pigeon chest is produced. The palate is high arched, in consequence of this, the teeth grow irregularly and are crowded. The upper teeth project and being exposed to the air are very liable to decay.

The inability to eat and breathe at the same time has been referred to above. The appreciation of flavours is lost owing to the obstruction interfering with the sense of smell, the appetite is thereby impaired and becomes capricious. Owing to the constant swallowing of mucus secreted from these adenoids, the digestive juices are rendered more dilute. These children frequently suffer from vomiting and digestive troubles. Adenoids may, therefore, be a serious cause of malnutrition.

The lungs are not filled sufficiently with air, the blood, therefore, suffers from the want of oxygen, unwarmed and unmoistened air makes the child more susceptible to bronchitis; indeed, these children frequently suffer from cough, both of bronchial origin and reflex due to mucus trickling into the larynx.

Owing to the proximity of these growths to the Eustachian tubes, the function of these tubes is interfered with. Air cannot enter the ears, deafness resulting. Ear discharges are of frequent occurrence, also owing to infection travelling into the ears from inflamed adenoids. Indeed, adenoids may be said to be the greatest of all menaces to the function of hearing.

Susceptibility to colds and the infective fevers and to glandular enlargements in the neck is common owing to the great liability of this adenoid tissue to inflammation.

Many nervous symptoms, such as night terrors, nocturnal incontinence of urine, convulsions and stammering may be explained by the interference with respiration, eating and sleep.

The mental attitude of these children is peculiar, they are dull and listless, irritable and peevish, they do not join in games and are very backward in school.

The above picture is one of typical nasal obstruction due to adenoids. It must be remembered that there are all grades of nasal obstruction and that one group or other of the above signs may be absent in a particular case. The important point is that whenever any of these symptoms are present, suspicion should be aroused as to the presence of this condition which has such a baneful influence on the growth and intelligence of these little patients.

Diagnosis may be obvious from the symptoms and frequently there is no necessity to make an examination. It is the exception rather than the rule to get a child so docile as to be able to see these growths in a post-nasal mirror. When examination is desirable, it is usually necessary to pass the finger into the post-nasal space and feel the growths.

The treatment should in all cases be surgical. The instrument used is a curette, and the growths are scraped away with this. At the operation, care should be taken to make a thorough

examination and remove all growths with the finger from the recesses into which the instrument cannot reach.

The results of the operation are marvellous as regards the improvement in general health, but when such advanced structural changes as pigeon chest, irregularities of teeth and palate have occurred, it is hardly to be expected to find an amelioration in these. Inveterate mouth breathers are so accustomed to not using their noses that the pernicious habit of mouth breathing may persist after the operation. It then becomes necessary to institute breathing exercise in order to re-educate these patients in the art of nose breathing.

THE EAR.

The ear and the structures connected with it consist of three parts :—

1. The outer ear, a canal running from the surface to the ear-drum or membrana tympani. This canal, in the infant, is like a collapsed tube, with the upper and lower walls in contact. In order, therefore, to convert it into an open tube for purposes of examination, the lobe of the ear should be pulled downwards. In older children and adults the canal is curved and can only be rendered straight by drawing the ear upwards and backwards.

2. The middle ear is a small cavity situated behind and normally cut off from the outside by the tympanic membrane. The middle ear is in communication behind with a further cavity known as the mastoid antrum around which are a number of smaller cavities, the mastoid air cells. This communication is a matter of practical importance as it permits of the extension of infective conditions from the middle ear to the mastoid antrum.

In front, the middle ear is in communication with the post-nasal space by a tube known as the Eustachian tube—this tube constitutes a passage through which small amounts of air constantly enter the middle ear during the act of swallowing. The function of this tube is to maintain the air within the cavity of the middle ear at the same pressure as the outside air. Anything, therefore, interfering with the patency of this tube may cause deafness. The bone immediately behind the auricle forms a conical projection ending in a teat-like process, this is the mastoid process, and in it are the mastoid air cells just spoken of. In an infant, there is no mastoid process or mastoid air cells, but there is always, however, a mastoid antrum present. The mastoid process and cells develop at about the age of two. In children, the Eustachian tube is relatively shorter, wider or more horizontal than in the adult, and this difference may provide an explanation

of the greater frequency with which infection passes up this tube to the middle ear in a child.

3. The internal ear consists of a maze of canals which not only serves the function of transmitting the sound vibrations from outside to the nerves of hearing, but also provide the apparatus for the perception of balance, so that any derangement in this area is likely to produce a sensation of giddiness.

It will be seen from the foregoing that there are three distinct parts to the function of hearing. The first is the conduction of sound and the second is the reception of sound, and the third is the perception of sound which is subserved by the hearing centre in the brain. The outer and middle ears are concerned with the conduction of sound, the internal ear is concerned with the reception of sound. Any condition, therefore, which interferes with the function of the outer or middle ears causes an " obstructive deafness " (obstruction to the conduction of sound). Anything which interferes with the function of the internal ear and the delicate nerve endings of the nerve of hearing or the perceiving centre in the brain causes a *nerve deafness.* These are two main types of deafness we are called upon to deal with, of which the first is by far the most common.

Common symptoms of aural disease.

It is well at the outset to bear in mind that there are four common symptoms of which a patient suffering from any form of aural disease, whether it be of the outer or middle ear, acute or chronic, may complain. The symptoms are these :—(1) Earache; (2) deafness in greater or lesser degree; (3) discharge from the ear; and (4) tinnitus aurium or the sensation of noises in the ear. It is seldom that a child will complain of any of these unless it is earache when severe. The symptoms are given, however, in order to help parents to recognise them when any condition leads one to suspect the ears to be at fault. Any or all of the above symptoms may be present in the conditions about to be described.

Examination of the ear.

The examination of the ear should be conducted with the affected ear facing a good light. The presence of swellings both in front and behind the ear should be looked for. The rules for straightening the canal of the ear given above should be followed. It is possible to see the commencement of the external auditory canal by this means. When the tympanic membrane is required to be seen, a beam of light either reflected from the sun or from

an electric lamp has to be projected into the ear through aural speculum.

Affections of the outer ear.

One of the commonest conditions met with in the external ear is *eczema* and *impetigo;* it is seen chiefly in uncared-for ill-fed children living under unfavourable conditions. These are the predisposing causes, the direct cause of the condition is nearly always a purulent discharge from the middle ear pouring over the skin of the auricle and infecting it. There are three distinct stages to the disease. At first, the ear is red and swollen, later on blebs form and burst, the exuded fluid drying in the form of scabs. In the last stage, the whole area may be denuded of skin presenting a raw and bleeding surface. Treatment should be directed to the cause, namely, the discharge from the middle ear (*see* later). Locally a starch poultice should be applied to soften and remove scabs and then the ear should be treated with a mild mercurial ointment (Hydrarg. ammon. grains 5 to the ounce of vaseline).

Furuncles or boils are not so common in childhood as in later life. They are situated in the outer portion of the external auditory canal and are, therefore, quite near to the surface. The exciting cause is a local infection often brought about by a chronic middle ear discharge acting on a denuded area in the canal or a scratch or injury resulting in an abrasion which provides the point of entrance of bacteria. Boils in the ear passage are very painful indeed, any manipulation of the auricle causes pain. Mastication in this condition becomes difficult owing to the movements of the jaw causing pressure on the inflamed canal of the ear. The condition is usually accompanied with a slight rise of temperature It is important to know, when a child complains of earache, whether the pain is caused by an inflammatory condition in the canal of the ear or whether the pain is of middle ear origin. The points are these. If a boil is present, there is usually some swelling to be seen either in front of the auricle or behind. Movements of the auricle cause pain and if the ear passage is examined, it will nearly always be seen that it is occluded by swelling.

In the very early stages a boil may be aborted by the insertion of a wick of cotton-wool into the canal and keeping this wool saturated with a solution of 1 in 4,000 hydrarg. perchlor. in equal parts of rectified spirits and water or in pure spirit. Continuous heat should be applied in the form of a hot-water bag. If these measures do not bring prompt relief, the furuncle should be incised under a short general anæsthesia and

the pus evacuated. Spirit dressings of the above solution should be applied and the ear cleansed and the dressings changed every day. After healing takes place, a mild antiseptic mercurial ointment should be applied for a few days in order to prevent recurrences.

Wax is secreted by the ceruminous glands in the front part of the auditory canal. New collections forming in front of old ones may cause the wax to be pressed deep into the ear until a large mass is formed filling up the whole canal and pressing on the tympanic membrane. Plugs of wax may cause much deafness and pain and sometimes an intractable dry cough. On inspecting the ear, they appear as a dark brown shining mass. The correct treatment is to evacuate the mass by means of syringing the ear with plain warm water. The wax may be old and very hard, in which case it should be softened by the instillation of a solution of sodium bicarbonate, grains 40 to the ounce of water. The ear should be filled with this solution three times a day for two or three days, allowing the fluid to soak in for ten minutes at a time. The mass is then sufficiently softened and can be easily removed by syringing.

Children are apt to insert *foreign bodies* into the ear. The common objects inserted are seeds or beads, stones, etc. Indian parents sometimes insert a whole garlic into the ear of a child complaining of earache. It cannot be insisted upon too strongly that a pair of forceps should never be used for the extraction of a foreign body in the ear. The body is usually driven further in by attempts with such an instrument. In the vast majority of cases and in nearly all types of foreign bodies, syringing is all that is necessary. If a good trial with a syringe has failed, a small blunt hook should be passed by sight and manipulated behind the foreign body which is then gently drawn out. Objects such as peas which swell in contact with moistures may have to be gently broken up before syringing. If these measures fail, it may be necessary to perform a cutting operation for the removal of the offender, but cases treated with care need never come to an operation. Ill-planned attempts to remove it may cause the foreign body to be driven into the middle ear through the tympanic membrane, or result in severe laceration of the tissues.

It is sometimes necessary to give a child a short general anæsthesia for the successful removal of a foreign body, either by syringe or hook.

Inflammation of the cartilage of the ear is often seen in Indian children who have their ears perforated for ear-rings. The small wounds are made without any aseptic precautions and

are then neglected with the result that a condition very painful and difficult to treat arises. Usually operations for the removal of infected cartilage have to be undertaken as simple incisions are not of much avail. Great deformity of the auricle may result from the loss of cartilage and subsequent scarring. This paragraph is merely to serve as a warning.

The inflammatory diseases of the middle ear.

Of predisposing *causes*, little may be said beyond the fact that conditions of lowered vitality render children more susceptible to middle ear inflammations. Only in this way can we explain the prevalence of these diseases in the ill-nourished and badly-housed children of the poorer classes.

Children, undoubtedly, suffer more frequently than adults. This is due in part—

(*a*) To the presence of adenoids in early life.

(*b*) To the greater susceptibility of children to the acute infective fevers nearly all of which are accompanied by catarrhal conditions of the nose and throat, and

(*c*) To the anatomical differences in the Eustachian tubes (*see* above) in the young as compared with the adult.

The most potent predisposing cause of middle ear disease is to be found in conditions interfering with nasal respiration. Children are the greatest sufferers in this respect, because of the presence in their post-nasal space of adenoid growths. These with or without enlargement of the tonsil constitute the greatest menace to the ear. Examination of any series of children suffering from adenoids will reveal in the vast majority of cases some degree of middle ear inflammation in one or both ears.

Broadly speaking, there are many conditions which are accompanied with a catarrhal process in the nose, post-nasal space and throat. Thus amongst the commonest causes may be mentioned—

I. The ordinary cold in the head.
II. The acute fevers—influenza, measles and scarlet fever, especially.
III. *Sore throats*—acute and chronic forms of tonsillitis.

There are three common types of middle ear disease which affect children. They are (1) catarrh of the Eustachian tubes, (2) acute middle ear suppuration, and (3) chronic middle ear suppuration. Quite 99 per cent. or over of all the above conditions owe their origin to a spread of infection into the middle ear from the post-nasal space via the Eustachian tubes.

Adenoids is the most potent factor in the production of this condition and children are much more frequently sufferers from this complaint than is generally recognised. Adenoids may not only cause a mechanical block to the openings of the Eustachian tubes, but they may, if they are inflamed, as they are during a common cold, cause an inflammation of the mouths of these tubes, the swelling thus produced causes an obstruction to the tubes and does not allow sufficient air to enter the middle ear. The air pressure within this cavity of the middle ear becomes less than that of the outside air causing the membrana tympani to be pushed inwards and become retracted. The main symptom of this condition is deafness. Children do not as a rule complain of deafness. It is only when a parent notices that the child is deaf and seeks advice that an examination of the tympanic membranes shows them to be retracted. Twinges of pain sometimes occur, but on the whole, the condition is painless. Permanent deafness is frequently the result of Eustachian catarrh if the cause is not quickly removed. Adenoids and infected tonsils should be removed without delay. After the operation, attempts should be made to restore the function of these tubes by inflating the ears with the Politzer bag. The nozzle of the bag is placed in one nostril and held there by the finger and thumb which also serve to close the other nostril. The patient is then either made to swallow a gulp of water or blow out his cheeks and concurrently with these actions the bag is forcibly compressed, air is thus forced up the nose through the Eustachian tubes into the ear. The treatment should be performed two or three times a week.

Infection travels up into the middle ear via the Eustachian tubes and causes an intense inflammation here. Owing to the obstruction in the tubes, the products of inflammation collect in the middle ear, ultimately, the tympanic membrane bursts and through the perforation thus caused, a discharge of pus runs out of the ear. The disease is usually accompanied with high fever in a child. Earache may not be complained of in the very young, though it generally is in older children. Restlessness, irritability, sleeplessness, crying without apparent cause, grabbing at the ears or rubbing the ears are all signs which should arouse suspicion.

For pain the following drops may be instilled into the ear four-hourly:—

℞

Acid carbolic ..	.. minims	iii.
Menthol ..	.. grains	iii.
Sweet oil of almond ..	..	℥i.

Sometimes, the condition is latent and the first sign is a discharge from the ears. The child should be put to bed, a smart purge is given and the nose and throat are treated as described in the section dealing with these conditions. If the ears are examined before the discharge has appeared, the tympanic membrane will be found to be red and swollen. The proper treatment is to incise the membrane before it has burst, as this shortens the attack. The discharge should be treated with the utmost energy. The great principle in the treatment of a discharging ear is that it should be kept dry and clean. For this purpose, the ear should be mopped out as often as the profuseness of the discharge makes the drying out necessary, little swabs of cotton-wool are made round the end of a match stick and these are inserted into the ear as far as they will go. Several are used until the last one returns dry. An instillation of the following drops is then made :

Acid carbolic, m. viii Spt. vini rect. half an ounce Water to the ounce	or	Glycerine acid carbolic, drachms 2 Glycerine to the ounce

The drops should remain in the ear for ten minutes, the ear is then emptied and dried again. If the above drops are not tolerated, a few drops of hydrogen peroxide may be instilled into the ear. Time should be given for frothing to take place and when this has ceased, the ear should be dried out with meticulous care. The majority of cases, if carefully treated, clear up and are well in two or three weeks' time. If the discharge persists much beyond this time, ionisation should be tried, it is very effective in completely stopping all discharge. After the acute symptoms have subsided, it is imperative that tonsils and adenoids should be removed. The general health of these young patients should be attended to. Fresh air, plenty of good nourishing food, and cod-liver oil and malt should be given, as the discharge is apt to recur in children, these recurrences coincide with colds and fevers.

Generally speaking, few cases become chronic if efficient treatment of the acute condition is carried out. One may say that if a discharge has lasted more than three months it has become chronic. There are many reasons for chronicity which have to be looked for by a specialist. The question of operation has always to be considered in this condition. The local treatment is the same as for acute middle ear suppuration.

Both acute and chronic middle ear diseases are potentially dangerous. The inflammation may spread from the middle ear into the antrum and mastoid air cells giving rise to acute

mastoiditis and mastoid abscess. When this complication occurs, there is great pain and tenderness in the bone behind the ear with later on a swelling in this region. By reason of the close relationship of the antrum with the brain and with a large vein—the lateral sinus—inflammation may spread to these parts producing in the first case abscess of the brain and in the second a blood poisoning. Infection may also spread to the brain coverings and the facial nerve which lies close to the middle ear, producing meningitis and facial paralysis. If the organ of equilibration is affected, great giddiness may result.

If a patient in the course of an acute or chronic suppuration of the middle ear develops high fever with or without rigors, complains of severe headache or pain of a serious character and tenderness over the mastoid process, if he has giddiness and vomiting or facial paralysis, then it is to be assumed that a complication of middle ear disease has set in. We should never wait for all these signs to appear. This list of symptoms is given in order to show the limit beyond which no case of aural suppuration should be allowed to go without operation.

The object of *syringing the ear* is to cleanse the external auditory canal. It should, therefore, never be done with such force that water may find its way into the middle ear through a perforation should one exist. Before syringing the ear, the canal should be rendered straight as indicated above. The stream of water should be injected steadily along the side or roof of the canal. In the case of foreign bodies or wax the idea is to allow the water to get behind the foreign body or wax which is driven out by the outflow of the returning water.

Frequent inspections should be made in order to find a little chink through which to direct the stream of water behind the foreign body and the ear should be completely emptied at the end of the small operation. Syringing the ear in acute and chronic middle ear disease should not as a rule be practised for fear of driving pus into healthy parts of the ear through perforations. It is legitimate, however, to employ it when a discharge is so very profuse that the ear cannot be rendered dry satisfactorily.

If the power of hearing is absent from birth or if it is lost in early life, the child will be a *deaf mute*. The former condition is known as congenital deaf mutism and the latter acquired deaf mutism. In the latter condition, mutism follows if deafness sets in before the ages of four to six according to the intelligence of the child. The congenital variety is due to absence or malformations of parts of the organs of hearing or to intra-uterine disease affecting the ears. By far the largest number of

deaf mutes, however, belong to the second class and a majority of these are due to preventable disease—such as measles, pneumonia, influenza, scarlet fever and to acute and middle ear suppuration just described. Meningitis affecting the auditory nerves and syphilis may also be causes. If the child is not totally deaf, every advantage should be taken of the remnants of hearing present even if one has to shout in speaking to these children. Education in lip reading should be started very early in life.

Modern treatment is directed mainly to the prevention of deafness. Treatment for deafness may improve the condition or even arrest its progress, but, unfortunately, when deafness is once firmly established, it is a slowly progressive condition for which there is no cure. The seeds of deafness are often sown in infancy and childhood, and it is during these periods of life that a watch should be kept for the first signs of aural disease. The most fruitful causes of deafness are due to preventable diseases in children. These have been mentioned above. Of all conditions, it is no exaggeration to say that the one that takes the first place in producing the catarrhal and suppurative processes in the ear leading to deafness is adenoids and diseased tonsils.

CHAPTER XXIX.

DISEASES OF THE EYE.

By

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A simple knowledge of the more common diseases of the eye is very important, but it must be remembered that these are often associated with, or the result of, constitutional disorders. Therefore to obtain the best results general treatment must be carried out in addition to the local measures. It need hardly be mentioned that in diseases of the eye of any degree of severity, the advice of an expert must be sought without delay.

BLEPHARITIS.

Inflammation of the lids, known as blepharitis, arises mainly from want of care and cleanliness or in debilitated children. It is also seen in association with conjunctivitis, or as the result of eye strain, or it is caused by an uncorrected error of refraction. The lid margins are red and swollen, yellowish crusts or scabs are formed along the line of the eye-lashes and these scabs on being separated leave small ulcers. The eye-lashes are matted together and the lids commonly are adherent to each other after sleep.

Treatment.—In the treatment of the external diseases of the eye it is most important to maintain asepsis and to avoid the application of strong washes or drops which may injure the delicate tissues, as trivial inflammations of the eye may lead to serious loss of vision. In blepharitis the crusts must first be loosened with an alkaline lotion (prescription No. 3) and then an antiseptic ointment, preferably perchloride of mercury ointment (prescription No. 5) or yellow ointment (prescription No. 6), gently applied to the edges of the lids. The latter ointment is difficult to dispense in India and if badly made up may act as an irritant. The general health also needs attention as the condition not infrequently arises in debilitated children. As in all conditions of the eye dependent on ill health, cod-liver oil or the

concentrated preparations containing the fat-soluble vitamins A and D have a special beneficial result.

Many of the milder and more chronic inflammatory conditions of the eye are due to or exaggerated by eye strain, so that their occurrence should make one suspicious of the presence of errors of refraction and such errors, present, should be corrected by glasses.

STYE.

A stye is a common disorder appearing as a red painful spot on the lid margin, often leading to swelling of the whole lid and difficulty in opening the eye. Styes not infrequently appear in crops and indicate that the child is out of sorts or has some error of refraction needing correction by glasses.

Treatment.—Hot compresses may abort a stye, but as a rule pus forms which can be evacuated by pulling out one or more of the affected lashes or by leaving the pus to come away of its own accord with the help of hot compresses. Perchloride of mercury ointment (prescription No. 5) should be applied to the lid margins twice a day, concomitant conjunctivitis should be treated (*vide infra*) and attention also should be paid to the general health.

CONJUNCTIVITIS.

Conjunctivitis is inflammation of the membrane covering the white part of the eye ball and the lining of the eye lids. The symptoms vary considerably according to the cause and type of infection. The causes are numerous:—exposure to wind, dirt and glare, foreign bodies in the eye, strain, and germ infection. The last mentioned sometimes occurs in epidemic form as illustrated by the acute contagious conjunctivitis or pink eye. The condition may be part of some general infection of the upper air passages such as cold in the head or influenza or measles. The purulent forms are due to infection by certain specific bacilli.

The affection usually begins with smarting or itching of the eye, and a sensation as if dust had got under the lids. The secretion is increased, the eye waters, and there is a dislike of exposure to light. The usually clear white of the eye becomes pink, red or streaked with blood vessels and the smooth lining of the eye becomes red and rough. The discharge is watery and muco-purulent, but in the more severe cases almost pure pus is exuded from between the lids. The lids swell, in severe cases to such a degree as to make the opening of the eye, even passively, difficult.

Infectivity.—The subject of infectivity of the discharge from the eye is one of great importance, as some even of the simpler forms are very infectious. The disease tends to appear in seasonal or epidemic form. The more severe forms with purulent discharge are highly infectious and liable to conveyance to other children through the media of towels or washing utensils, by flies or by the drying of minute particles of matter, which may be carried through the atmosphere. Not only should the greatest care be taken when the discharge is purulent, that other children are not infected, but if one eye is infected, the other eye should be guarded by a shield or pad and bandage.

Treatment consists in bathing the eye frequently, the application of antiseptic drops and the prevention of the sticking together of the lids. In addition to such local measures, attention is desirable to the general hygiene and health of the patient. When there is debility, tonics, especially cod-liver oil, good food and fresh air are very necessary. In the more mild cases, the child should be allowed to take exercise out of doors, the eyes being guarded from excessive light by plain tinted glasses. In the more severe or purulent cases, there will be marked prostration. The child should be put in bed and special attention should be paid to the nourishment. The condition should be treated on the general lines applying to any other acute illness.

For the purpose of bathing the eye, a warm mild lotion should be employed, such as boracic lotion (prescription No. 1) or normal saline lotion (prescription No. 2). The eyes of young children are best bathed by allowing a stream to run from a piece of saturated cotton-wool, but for older children an eye bath or an eye dropper may be used. Great care should be observed in opening the eyes. On no account should pressure be exerted on the eye ball. The thumb of one hand should depress the lower lid while the two fingers gently raise the upper one.

After bathing, one drop of antiseptic is instilled into the eye, or better still when skilled hands are available, the lids are painted out. For this purpose a solution of argyrol 10 per cent. (prescription No. 10) or protargol 5 per cent. (prescription No. 9) is used. Antiseptic drops should never be used more than twice a day and for more than one week's duration. It is most important that the lids should not be allowed to stick together, thus locking up the infective discharge. To prevent this, after each bathing of the eye, a few drops of sterile paraffin or castor oil or a little borovaseline should be put into the eyes. The number of times that the above toilet should be performed will depend on the gravity of the infection. For the milder cases,

three times a day will suffice, but in the acute purulent cases, it must be carried out every hour if the eye is to be saved.

Ulceration.—Should the cornea lose its lustre or greyish spots appear on the surface and should the redness of the eye ball change to a darker hue, ulceration has taken place. In doubtful cases this can be demonstrated by instilling a drop of 1 per cent. fluorescein (prescription No. 13) into the eye followed by a normal saline wash. If an ulcer is present it will be stained green otherwise no stain will be seen. The same treatment should be carried out, but iodoform and atropine ointment should be substituted and put into the eye twice a day (prescription No. 8).

If the pain is severe under no circumstances should cocaine drops be instilled. Atropine ointment, warm bathing and hot compresses are the local applications to relieve pain.

After the acute stage has passed there may be a tendency for some slight redness of the eye to persist. At this stage astringent drops are indicated (prescription No. 11). Such drops are also useful in the mild chronic cases due to dust, glare or eye strain.

SPECIAL TYPES OF CONJUNCTIVITIS.

Ophthalmia neonatorum (babies' sore eyes) is a truly dreadful, contagious disease of the eyes and is commonly due to the gonococcus. The toilet of the eyes in the early days of life is a very important part of the nurse's duties. Failure to attend to this point may expose the infant to an attack of ophthalmia neonatorum, an infection of such virulence that the eyes may be permanently damaged or even lost. The disease is preventable by the treatment of the baby's eyes immediately after. birth, which consists of cleaning the lids with boracic lotion (prescription No. 1) then separating them and instilling one or two drops of 1 per cent. silver nitrate into the eyes (prescription No. 14). Should however infection occur, the eye becomes inflamed and red about the third or fourth day, the lids swell and pus oozes from the eye.. If the disease progresses unchecked the cornea becomes filmy, then white and deep ulceration occurs leading to perforation and infection of the deeper parts of the eye.

Treatment is on the lines laid down for purulent conjunctivitis and only by the most constant and skilled attention can the eye be saved.

Trachoma or granular lids is a common disease of the eyes in children in Northern India. It is uncommon amongst Europeans and Anglo-Indians. It is often confused with vernal conjunctivitis (spring catarrh) and follicular conjunctivitis which are common eye diseases in young children.

Trachoma is a contagious disease of the eyes accompanied by pain, swelling of the lids and a thin muco-purulent discharge. On everting the lids, the inflamed conjunctiva will be seen to be studded with minute granules. The condition is serious and if neglected will be fraught with the most disastrous consequences to vision. It is of importance that the disease be recognised early, both on account of its infectivity and on account of the urgency for skilled treatment. The diagnosis of early trachoma should be left to an eye specialist and he should outline the necessary treatment to the general practitioner. Much serious damage can be done to the eyes by improper treatment.

Vernal conjunctivitis (spring catarrh) and *follicular conjunctivitis* are not infrequently met with in young children in India and are liable to be confused with trachoma. They are usually accompanied by enlarged tonsils and adenoids.

Treatment.—The tonsils and adenoids should first be removed, general tonic treatment and simple lotions for the eye should then be prescribed. Under no circumstances should caustic irritant drops be employed.

PHLYCTENULAR DISEASE.

This condition arises in children as the result of bad hygiene, faulty or deficient diet and after debilitating illnesses.

On the surface of the conjunctiva or cornea there appear one or more greyish spots from which there is a small brush of injected blood vessels. After a short while these pimples become yellowish and form small ulcers. Should they appear on the conjunctiva they clear up quickly leaving no trace, but on the cornea there is danger that in healing some degree of opacity will be left, leading to impairment of vision. Associated with these ulcers there is pain, difficulty in opening the eye, increase of tear secretion and photophobia.

Treatment consists in the regulation of the diet and attention to the general hygiene and the administration of cod-liver oil. Enlarged tonsils and adenoids must always be removed as a preliminary to treatment. It is harmful to keep the patient in a dark room. Local treatment for the eye consists in frequently bathing the eye with non-irritating lotions and the application of one drop of hyoscine (prescription No. 12) once or twice a day to relieve the spasm of the iris. In the acute stage, atropine ointment is better avoided. In the later stages mercury ointment (prescription No. 5) will prove useful.

KERATOMALACIA.

Keratomalacia is a common disease in certain parts of India among young children under five years of age. It is usually seen in those suffering from some chronic disorders of the intestine or liver or in marasmus. It is, however, also seen in apparently well nourished children. The disease is due to the lack of fat-soluble substances in the diet or inability to assimilate the fat in the food. The disease is first characterised by smokiness and wrinkling of the bulbar conjunctiva in the palpebral aperture. The affected conjunctiva is sometimes covered by a greasy substance (xerosis). Later the surface of the cornea becomes grey in colour, melts away like ice and if untreated leads to the destruction of the eye. There is usually very little pain and very little inflammatory reaction in the eyes. The treatment of the disease is largely constitutional and the intestinal tract should first be treated. Small doses of crude cod-liver oil is the best specific remedy, the dose of which should be from 5 to 30 drops three times a day. Orange juice should also be freely given as there is definitely a scorbutic element in the disease. The mother who is feeding an infant suffering from the disease should also be given good nourishing food and cod-liver oil internally.

INTERSTITIAL KERATITIS.

Interstitial keratitis is a common disease in India but is seen more frequently amongst Indians than Europeans. It is essentially a disease of youth, usually occurring between the sixth and twentieth year and is more often seen in girls than boys. Both eyes are generally attacked in succession, but there is frequently an interval between the attacks. The second eye may become infected even in the course of treatment. Fifty to seventy per cent. of the cases are due to hereditary syphilis. Of the remainder many are tubercular. The syphilitic cases as a rule show some of the signs of the hereditary disease, such as Hutchinson's peg-top shaped central incisor teeth, flat nose, deafness, enlarged lymphatic glands, etc. Interstitial keratitis is responsible for much unnecessary partial and complete blindness in India. The prognosis is good provided treatment is commenced early. In syphilitic cases small doses of sulfarsenol and bismuth should be given by injection once a week intramuscularly into the buttocks. In tubercular cases general tonic treatment, and cod-liver oil are important. Locally 1 per cent. atropine ointment should be used in the eyes once daily during the acute stage of the disease.

SQUINT.

Squint is a defect which results when the visual axis of one eye deviates from the point of fixation. It may be constant or periodic. Deviation towards the nose, the more common variety, is known as a convergent squint, and outwards a divergent squint. There is no paralysis of the eye muscles so the condition is known as a concomitant squint. It usually occurs before the third year of life. An infant may occasionally show a tendency to squint in the first two years of life but this disappears as soon as the power to fuse images becomes developed.

The cause of concomitant squint is usually due to a refractive error and a lack of binocular fusion. Hypermetropia (long sight) is commonly present with convergent squint and myopia (short sight) with divergent squint.

Treatment.—The error of refraction should be corrected by the constant use of appropriate glasses and care should be taken to exercise the squinting eye. The latter can be best accomplished by occluding the non-squinting eye for a couple of hours daily with a pad and bandage. Failure to exercise the squinting eye in the early years of life will result in permanent defective vision in this eye from disuse.

SOME PRESCRIPTIONS FOR DISEASES OF THE EYE.

Lotions.

Prescription No. 1.

Boracic acid ..	.. 200 grains.
Distilled or sterilised water	.. 1 pint.

Prescription No. 2.

Sodium chloride ..	.. 1 drachm.
Distilled or sterilised water	.. 1 pint.

The eyes should be washed with a little of the warm lotion for a few minutes every two to four hours.

Prescription No. 3.

Sodium bicarbonate ..	.. 60 grains.
Distilled or sterilised water	.. 1 pint.

Wash the lid with a little of the warm lotion morning and evening.

Ointments.

Prescription No. 4.

Boracic acid ..	.. 5 grains
White vaseline ..	.. ½ ounce.

Prescription No. 5.

Perchloride of mercury	1/16th grain
White vaseline	½ ounce.

Prescription No. 6.

Yellow oxide of mercury ..	2 grains.
White vaseline	½ ounce.

Prescription No. 7.

Atropine sulphate	2½ grains.
White vaseline	½ ounce.

Prescription No. 8.

Iodoform	2½ grains.
Atropine	1 grain.
White vaseline	½ ounce.

A little of the ointment to be put inside or smeared on the eye lids once or twice a day as required.

Drops.

Prescription No. 9.

Protargol	25 grains.
Distilled water	1 ounce.

Prescription No. 10.

Argyrol	50 grains.
Distilled water	1 ounce.

Prescription No. 11.

Zinc sulphate	2 grains.
Boracic acid	5 grains.
Distilled water	1 ounce.

Prescription No. 12.

Hyoscine bromide	1 grain.
Distilled water	½ ounce.

One drop to be used once or twice a day.

Prescription No. 13.

Fluorescein	2½ grains.
Sodium bicarbonate	2½ grains.
Distilled water	½ ounce.

Prescription No. 14.

Silver nitrate	2½ grains.
Distilled water	½ ounce.

A few drops to be used as directed.

CHAPTER XXX.

DISEASES OF THE SKIN.

It will be noticed in subsequent pages that many skin diseases other than those caused by parasites or infections are due to generalised disorders rather than the result of local irritation. It is therefore a sound plan in all cases to seek for any evidence of deviation from the normal health, otherwise treatment directed purely to the local condition may prove unavailable.

RED GUM.

Red gum (lichen urticata)—a name given by nurses to a trivial eruption of the skin of infants consisting of little groups of red or white pimples, hard and shotty to the feel, often with a translucent centre, but from which no fluid exudes when pricked. The forearm, leg, and trunk are its favourite sites. It is very irritable. A modification of diet, a few doses of Prescription No. 13, scrupulous cleanliness and the application of a lotion consisting of one drachm of oxides of zinc, half an ounce of glycerine and six ounces of limewater, will relieve the irritation and soon cure the complaint.

URTICARIA.

Urticaria (nettlerash or hives) is a disease to which certain children are susceptible. The disease appears to run in families and is associated with a family disposition to other exudative conditions such as asthma, hay-fever or eczema. The attack is usually induced by the ingestion of some particular form of food—eggs, pork, shell-fish, or fruits—to which the child is intolerant. Again it may appear as the result of indigestion and fermentation within the intestine. A common cause in this country, which must not be overlooked, is the presence of worms, particularly ascaris, or of amœbic infection of the intestine (*see* Chapter XI). The same condition is often seen after the injection of therapeutic sera. It is probable that in hypersensitive children the same inhalations which may give rise to asthma, may be productive of the eruption.

The disease is of easy recognition. A number of raised wheals, whitish or pale red in colour and of varying size, appear suddenly and may grow to cover an extensive area. The wheals

are intensely irritating, disturb the sleep and arouse an irresistible urge to scratch.

Treatment.—Some alleviation may be obtained by the application of lotions (sodium bicarbonate grains 10, glycerine two drachms and water to one ounce or calamine grains 15, zinc oxide grains 10, glycerine minims 30, liquor calcis one drachm, camphor water to one ounce) but the disease is constitutional and the cause must be sought and if possible eradicated. Apart from this the bowels must be well opened by magnesia and an alkali mixture given. In addition calcium lactate grains 2 to 5 three times a day. A hypodermic injection of colloidal calcium ½ to 1 c.c. will often act like a charm, clearing up the condition in a few hours.

Ephedrine sulphate in doses from ⅛ to ¼ of a grain, according to age, is effective in some cases. For those cases due to serum injections adrenalin minims 3 to 5 should be used.

Every precaution must be taken to prevent the child damaging the skin by scratching and it is desirable, if sleep is disturbed, to administer sedatives.

ECZEMA.

Eczema is a troublesome and obstinate disease of somewhat obscure causation which is met with in young children who are usually otherwise flourishing. The sites most commonly affected are the scalp, cheek, neck and arms. A number of minute watery vesicles appear, the surrounding skin being irritable, red and hot, the contents of the vesicles soon become whitish, the irritation increases and the child is sure to scratch and break them. The discharge still further irritates the surrounding skin—indeed, it seems almost to burn it and to remove the thin outer layer. After a short time the discharge hardens into a yellowish crust, which cracks in many places and from these cracks more of the clear irritating fluid exudes, as well as from under the outer edges. Portions of the crust may even become detached, leaving behind a raw, angry, moist surface When of a mild form, the crops of vesicles die away naturally, the skin of the affected part scaling off afterwards; but fresh crops of vesicles are apt to recur.

The causes are numerous. (1) General causes :—

(*a*) Certain children appear to be upset by specific articles of diet, that is to say they are susceptible and there is a considerable family influence. Other members of the family may show the sensitiveness by manifestations such as asthma, hay-fever or urticaria.

(*b*) Constipation, gastro-intestinal disturbances, in some cases excess of sugar in the diet and excess of overfeeding of any kind. The rash is particularly liable to appear during teething.

(*c*) Bacillary infections of the bowel.

(2) Local causes :—Irritating discharge from the nose or ears or constantly wet diapers.

The disease is not contagious.

Treatment.—First, adjust the diet so that it is suitable to the age and weight, particularly guarding against excess of starchy foods and sugar and attention to the bowels. In dealing with susceptible children it must be remembered that articles of diet appropriate to other children may provoke the rash and it may be necessary to remove in turn milk, eggs or cereals in the endeavour to discover the offender. For bottle fed babies Pierson recommends removal from the diet of fresh milk and its substitution by some form of synthetic milk such as Almata.

Local treatment:—If the rash is dry, calamine lotion—if wet, resorcin ointment, grains 10 to one ounce to equal parts of lanoline and soft paraffin. Instead of this a lotion may be used. The lotion we have found most effective is forty grains each of zinc oxide and zinc carbonate, one drachm each of olive oil and glycerine of carbolic (B. P.) added to one ounce of limewater. This is well shaken and then dabbed on to the raw surfaces several times a day, and allowed to dry. While any inflammation remains, this treatment should be continued. Crusts should be removed with starch poultices, and pieces of stiff cardboard bandaged in front of each elbow to prevent the child from scratching the site of the lesion. Soap should be avoided and oatmeal in muslin bags used in its place. In certain obstinate cases arsenic is of value.

In older children, when the condition has become chronic and does not yield to treatment, an intramuscular injection of 5 c.c. of the patient's own blood has effected a cure.

PRICKLY HEAT.

Prickly heat is an affection of the skin due to excessive perspiration. The appearance is familiar but nevertheless it is often confused with measles (for distinctive rash of measles, *see* Chapter XXV). It is important that this minor trouble should be treated adequately, as the constant itching may interfere seriously with sleep and furthermore if the child scratches the skin may be infected and subject to more serious eruptions. In this as in all other forms of irritating skin rashes the first step

should be to cut the patient's nails as short as possible. Clothing of an irritating texture such as wool or flannel next the skin should be replaced by soft linen or silk. Affected area should be powdered with a mixture as follows :—

Zinc oxide 10 grains, bismuth subgallate 10 grains, talc powder to 1 ounce.

The addition of one tablespoon of sodium bicarbonate to the morning bath will do much to relieve the irritation.

Colonel Acton, I.M.S., was of the opinion that there is a close relationship between seborrhœa of the scalp and extensive infection of the body by prickly heat and that the rash yields rapidly to remedies like sulphur which is a specific for seborrhœa of the scalp. For this reason he advocates that the initial treatment should be for the scalp which supplies the organisms which cause prickly heat. He suggests that the scalp should be washed with a soap spirit lotion as follows:—Spiritus rectificatus 1 ounce, soft soap 2 ounces and tincture of lavender one teaspoonful, and that a hair dressing should be rubbed into the roots night and morning. His prescription is :—

Eurosol	grains 40
Spiritus ætheris	minims 30
Spiritus rosemary	„ 30
Oleum ricini	„ 4
Rose water	ounce 1

For the rash itself he advocates the following powder :—

Sulphur	ounce ½
Camphor	„ 1
Zinc oxide	„ 2
Starch	„ 3
Boric acid	„ 1

This powder should be lightly dusted on with a powder puff after the morning and evening bath. He emphasises the fact that the powder must not be rubbed in with the hand, but merely lightly dusted on.

As regards clothing, the mother must remember that the child should not wear flannel or wool next the skin, and that silk or linen of the lightest texture are the best materials.

There is no truth in the assertion that prickly heat is a good thing, and that it should not be "driven in". The fact is that it seldom appears much upon debilitated subjects, whose skins are deficient in blood; it affects more readily the healthy integument,

but in no way contributes to health; on the contrary, the function of the affected skin is, for the time being, impaired.

SCABIES.

Scabies (*the itch*) is a contagious affection, dependent upon the presence of an animal parasite, which burrows beneath the skin and produces by its irritation the appearances which characterise the affection. The favourite positions of the parasite are between the fingers, at the elbows, and on the insides of the thighs; but in young children the hands are rarely affected, the belly, feet, and ankles being selected. Intolerable itching, particularly after the child has become warm in bed, is the most annoying symptom; the scratching which results removes the tips of the minute pimples which mark the positions of the insects, and sores may be produced, which may prove troublesome to treat.

A child affected with the itch *should be isolated* from all others. All clothes which he has recently worn should be boiled before being washed. At bed-time a hot bath is ordered, and, while in the bath, the child is thoroughly scrubbed with a loofa, or hand rub, and soft soap. The soap is well rinsed off in more hot water, and then the skin is vigorously dried with a towel, and sulphur ointment well rubbed in to the whole affected area. This process is repeated for three evenings and by this time a cure should have been obtained provided the patient is not reinfected from bedding or clothing which must all be boiled as soon as it is removed from the patient. Preferably during treatment the child should be clad in old garments which can be destroyed. For a young child the ointment should be used a quarter or half strength as the full strength ointment may cause inflammation of the skin.

RINGWORM.

Ringworm is the product of a vegetable parasite. It is contagious and appears either on the head or body. It occurs in circular patches, varying in size from that of a two-anna piece to that of a rupee. The surface of these patches is covered with scurf of a dirty whitish colour, the margins being reddish and elevated. When the scalp is attacked, the hair breaks off a little above the surface, so that patches of baldness result; but when the disease is cured, the hair grows again. On the body, ringworm is easily cured, but on the scalp, it is generally troublesome and persistent.

Treatment.—When situated on the body the most effective of applications is chrysarobin ointment, but this has the drawback

of staining the skin and linen. As an alternative one of the following may be used :—

White precipitate ointment (ung. hydrarg. ammon. dil) and sulphur ointment, or salicylic acid grains x, lanoline 1 ounce.

Before applying the ointment the affected parts should be washed well with ether soap such as Synol. When the disease is situated upon the scalp, the hair on the affected areas must be clipped as close as possible and the same treatment employed. Treatment is more rapid and effective if the hair is removed by X-ray applications.

SHINGLES (HERPES).

Shingles is a vesicular or blister-like eruption. The first variety, which appears as a number of little blebs about the lips and forehead, is not itself serious. It is usually the result of fever, commonly malaria or it may occur after more severe diseases like pneumonia, where its appearance is regarded as of good import.

HERPES ZOSTER.

In this variety the distribution is on the body or limbs and follows the track of a nerve trunk. Commonly it encircles half the body in the line of the ribs but seldom passes across the middle line. This variety is painful, indeed there may be considerable pain before rash appears and the pain may persist even after the vesicles have dried up. It is accompanied by considerable constitutional disturbance. There seems to be a definite connection between chickenpox and herpes zoster.

Treatment:—The eruption should be protected by the application of calamine lotion at frequent intervals and care should be taken that the patient does not scratch. For the pain and discomfort small doses of aspirin or sodium salicylate and bromide may be necessary to allay the restlessness at night. After subsidence tonics will be necessary.

IMPETIGO CONTAGIOSA.

Impetigo contagiosa appears on the face, usually around the mouth as a series of spots or sores which quickly form raised crusts. The tendency is to appear in children who are debilitated or improperly fed. As the name implies the disease is highly contagious and the child should be isolated. An ointment of ammoniated mercury, grains 5 to the ounce, should be applied and the general health of the child should receive attention.

BOILS.

Boils are one of the most troublesome of common complaints to which the child in India is subject, especially during the hot weather or when nutrition is impaired. Treatment is required generally and locally. The general treatment consists of adjustment of the diet with fruit juices for infants and fresh vegetables and fruits for older children. Radiostoleum should be given in doses according to age and also Crooke's collosal manganese in proportionate doses, the adult dose being one teaspoonful three times a day. A change to the hills usually produces a cure in a very short time. Failing this, the most valuable therapeutic measure is ultra-violet rays.

Local treatment:—The practice of keeping constant fomentations or wet packs on the boils is not advocated. While it may afford relief to the particular boil under treatment, it renders the surrounding skin sodden and so opens the part to further infection and the production of a crop of boils in succession to the one. The inflamed area should be covered with dilute mercurial ointment or if there is a large crop of small boils, calamine lotion may be used. If the boils come to a head, a pad of lint soaked in 50 per cent. solution of magnesium sulphate (epsom salts) may be applied which will quickly draw out the enclosed pus. As soon as the boil is empty of its contents the part should be swabbed with alcohol and covered with a light dressing gauze soaked in 1—1,000 acriflavine solution to avoid infection. Boils should not be squeezed as this procedure tends to spread the infection. Those boils which fail to come to a head are known as blind boils and may require opening if pus accumulates within, otherwise the place should be treated with the mercurial ointment. Vaccines, though much discussed, are uncertain in their action and should be reserved for those cases in which the boils are few and far between. In children the dosage should be low.

WARTS.

Warts are small unsightly growths that sometimes appear on the back of the hands or elsewhere and may be treated effectively by painting the part with collodium callosum; of which the formula is as follows :—Salicylic acid 8, extract of Indian hemp 1, flexile collodium 60. Care should be taken not to apply the fluid to the healthy skin. If the warts are numerous one or two X-ray exposures will effect a rapid cure.

CHAPTER XXXI.

ACCIDENTS.

BRUISES, BLEEDING, WOUNDS, BURNS AND SCALDS, AND SPRAINS.

(1) *Bruises.*

When a part is bruised, it turns "black and blue", because the minute blood vessels beneath the skin have been ruptured by the force employed, and the blood flows into the loose fat which underlies the skin. The more blood that has been thrown out, the greater the intensity of the discoloration. If in addition to discoloration there is heat of the part, then inflammation accompanies the bruise.

By treatment we endeavour to prevent any more blood being effused, to prevent or allay inflammation, and to induce absorption of the blood already effused. The application of cold in the shape of ice, or of a cold lotion such as lead lotion, or No. 39, will usually effect the first and second of these objects. A piece of folded rag, saturated with the lotion, should be firmly and evenly bandaged upon the injured part. Leeches should never be applied to a bruise, they only increase the mischief. Subsequently, when only some hardness and discoloration remain, rubbing the part once or twice daily with the soap liniment—soft soap, grains 40; camphor, grains 20; ol. olivæ, minims 5; alcohol (90 per cent.) ½ ounce; water ad 1 ounce—will prove useful. Rest and elevation of the injured part should always be adopted.

(2) *Bleeding.*

Pressure and cold are the two chief means by which bleeding may be arrested; but there are medicaments known as styptics, which are also often very useful; and finally there is the tourniquet or ligature.

It is usually found that when the edges of a wound have been brought together, and the part firmly but not too tightly bandaged, all bleeding ceases.

Should these means not prove sufficient, a thick, small, hard pad of linen placed over the bleeding spot, and secured there by a firmly adapted bandage, will nearly always completely staunch the flow. By and by the tightness of the bandage may be relaxed,

say after two or three hours; but should bleeding then recur, it will be necessary again to tighten it, taking care that the limb be bandaged from its extremity upwards to beyond the wound.

Wound of an artery.—Should a jet of blood spout from a wound; at once press the point of the finger upon the bleeding spot, and keep it there till preparations are completed for dressing the wound properly, when by placing the edges in apposition and adapting a pad as above described, success will probably be attained. Cold should then be applied, and the child should be kept extremely quiet for a couple of days, during which time the pad, if removed for the purpose of cleansing and dressing the wound, should be replaced with the original care, but diminished pressure.

Should a jet of blood issue forcibly the instant the finger is removed, a ligature should be applied. By means of a forceps or pair of tweezers seize the piece of flesh from which the blood is issuing, including, of course, the bleeding orifice—a portion about so large ▲ only need be pinched up. Then, while still holding it tightly with the forceps, a piece of thin thread or stout silk should be passed around the raised part at the place shown by the black line, and tied as tightly as possible by an assistant: one end of the cord should be cut off short, and the other left hanging from the wound. In a few days it will become detached, and allow of removal.

Should it be impracticable to apply a ligature, a handkerchief should be tied around the limb between the wound and the heart, while pressure with the pad is still to be made upon the wound itself. It may be difficult to tighten the handkerchief sufficiently; in such a case, by passing a short piece of stick underneath and giving it a few twists round, tightening to any extent may be made. But it is dangerous to keep up a severe tightening for any length of time; the circulation is thus stopped, and mortification might ensue. Very severe tightening is seldom essential and if it be, gradual loosening should be made after a short time, to ascertain how far the handkerchief may with safety be relaxed.

Oozing from a cut or torn wound will yield to moderate pressure.

Bleeding from a vein is known by a copious continuous flow of dark-coloured blood. This is not of anything like the same gravity as bleeding from an artery. Pressure and elevation are almost always sufficient to arrest it. Should direct pressure upon the wound not prove sufficient, then pressure should be made with the handkerchief and stick between the wound and the end of the limb—that is, "below" the wound, not above it.

Whenever the bleeding has to be controlled by the handkerchief and stick method, whether for arterial or venous bleeding, the services of a doctor should be obtained as soon as possible.

(3) *Wounds.*

(*i*) Incised wounds associated with serious bleeding are treated by the methods enumerated above. The wound should be painted immediately with tincture of iodine. It is a mistake to wash the wound with water. Such a procedure prevents the tincture of iodine exerting its full action which it can only do when the wound is dry and, further, water may infect the wound unless previously boiled. After the tincture of iodine has been applied, the wound is cleaned with pellets of cotton-wool dipped in turpentine or hydrogen peroxide solution. If tincture of iodine, turpentine and hydrogen peroxide solution are not immediately available one of the following may be used :—

Alcohol in the form of whisky or brandy, with an equal quantity of cooled boiled water.

Condy's fluid, two tablespoonfuls to a pint of cooled boiled water.

After cleansing the wound there will be a certain amount of oozing, but this need not cause alarm since it will stop when the dressing is applied.

The best substance to use as a dressing is gauze. Gauze can now be obtained in packets ready sterilised.

Simple cuts can be adequately treated by surgical strapping (sticking plaster) after the initial cleansing. The edges of the wound are accurately opposed with one hand and the piece of strapping placed across. This strapping should be left undisturbed for five days, provided that the wound is not inflamed and is not painful. The careful use of strapping makes the sewing of wounds unnecessary. This method should always be applied to cuts on the face. Leukoplast-rapid dressing "Hansaplast" is a combination of gauze and surgical strapping and can be obtained from any large chemist. A small box is recommended to be kept in the medicine cupboard. The cost is small. Should, however, the wound become septic as evidenced by throbbing pain, swelling, redness or discharge, every second strip of plaster should be removed and the wound syringed with 1—100 carbolic, eusol lotion or hydrogen peroxide, thrice daily. If the inflammation persists all strapping should be removed, and after the wound has been syringed, large hot fomentations are applied or renewed every four hours. When the wound is once again healthy in appearance, that is, of bright red colour and

presenting a clean surface, aseptic water dressings only need be applied.

(*ii*) Lacerated wounds seldom bleed much, but they are especially liable to inflammation and suppuration. There may be a great deal of difficulty in thoroughly cleansing them, but this must be effectually and patiently done. The best method is to saturate a pledget of wool with ordinary tincture of iodine and then swab the whole wounded surface with the solution. Lock-jaw or tetanus occasionally follow such injuries from dirt and germs getting into the wound. Tincture of iodine, either with a brush or as described above, is the best method of disinfecting such a wound. The deeper parts, if they cannot be got at, ought to be syringed out with eusol or dettol lotion. A piece of lint, doubled twice upon itself, and saturated with eusol lotion, should now be applied so as to cover more than the extent of the wound; over this a piece of plantain leaf, oiled silk or gutta-percha tissue is to be laid, and the whole bandaged loosely.

If after twenty-four hours the wound is painful, throbs and becoming red and swollen, the initial dressing should be removed and fomentations applied. Fomentations are best made by rolling pieces of lint or cotton-wool, of sufficient size to more than cover the wound, in a towel. The centre of the towel is then dipped into boiling water or better, in a saturated solution of magnesium sulphate heated to boiling point. [To prepare the latter take two pints of cold water and add slowly magnesium sulphate (epsom salts), stir until no more crystals will dissolve. If glycerine is available add three ounces to each pint of solution]. After leaving the towel in the boiling water or magnesium sulphate solution for from three to five minutes, the two ends of the towel which are dry are then taken one in each hand and as much fluid as possible squeezed out. The lint or wool is then taken from the towel and applied to the wound.

Fomentations should be re-applied every four hours by day and once or twice during the night if the wound is very inflamed and there is much discharge of pus (matter).

Wounds of the palm of the hand may be accompanied with severe bleeding. The best thing to do, pending the arrival of a surgeon, is to place a padded clean golf ball or cork in the hand, which should then be closed and bandaged firmly upon the ball or cork, while at the same time the elbow should be bent as much as possible, and so retained by means of a bandage.

(*iii*) Punctured wounds, that is, wounds which are produced by sharp, long, narrow instruments penetrating the flesh, such as might be caused by treading upon a nail, or falling upon a splinter of wood, are often troublesome. The great thing is to allow the

orifice to remain completely and freely open, for the free discharge of matter. Of course, should any portion of a foreign substance remain embedded in the wound, every endeavour should be made to remove it with the forceps, the orifice being enlarged for that purpose if necessary. Magnesium sulphate fomentations should be applied (*see* Chapter XXVII, Tetanus).

(4) *Burns and scalds.*

A severe burn or scald is chiefly dangerous on account of the shock it occasions to the whole system. The great pain is accompanied with violent shivering, a pallid face and cold hands and feet.

The dangers from a burn are firstly those of shock, dependent largely on the surface area of the burn, but also to some degree on the depth. Those on the chest, abdomen and head are the most serious. Secondly, there is toxic absorption from the burnt tissues and some degree of sepsis is inevitable, and thirdly, there are more remote complications, pneumonia or ulceration of the bowels which may supervene about the tenth day.

In treating a burn there are three matters requiring immediate attention, viz., to relieve the pain, to counteract the shock, and to protect the injured surface from contact with the air. If the patient be seen immediately after the accident, give a dose of brandy into which laudanum to the extent of one drop for each year of age has been put or a hypodermic injection of morphia grain 1/40 to 1/30 for a child of one year old.

The burnt part should be well cleaned with spirit. All dead tissue should be cut away with sterile scissors; blisters should be pricked and the overlying skin cut away.

The best preparation to apply is tannic acid freshly prepared in a 2½ per cent. solution. There is a good preparation of tannic acid jelly on the market under the name of "Tannafax" prepared by Messrs. Burroughs Wellcome & Co. A four-ounce tube is recommended to be kept in the medicine chest.

After cleansing the scald or burn the part is covered with dry sterile gauze to thoroughly dry the part. The tannic acid jelly is thickly spread on gauze and quickly applied when the gauze on the wound is removed. It is very necessary that the wound be dry otherwise the burnt part will not be thoroughly tanned and the efficacy of the treatment much impaired. If tannic acid jelly is not available, 2½ per cent. tannic acid solution is used, dipping gauze in the solution and applying the gauze to the burnt part.

If these preparations are not available a very strong infusion of tea may be employed. The treatment should be repeated until

the surface has ceased to be moist and red and a black skin or coagulum has formed. When the coagulum has formed no dressings are necessary.

Ointments or lotions containing cocaine or carbolic acid should never be used.

It may be necessary to repeat the administration of stimulants once or twice within the first twenty-four hours, but reaction will by that time probably have been fully established, and therefore we must be very guarded in the exhibition of alcoholic stimulant lest the excitement produced prove injurious.

The liability to contractions occurring during the healing of a burn should always be kept in mind. A limb should invariably be maintained in the straight position.

The administration of ample fluid plays no small part in the treatment of burns. The shock and toxic absorption inseparable from such accidents will induce some degree of acidosis. Sodium bicarbonate in doses of from ten to thirty grains is therefore indicated.

(5) *Sprains.*

A sprain is a twist of a joint, which stretches and perhaps partly tears the ligaments which bind the bones together.

Upon the occurrence of the accident there is a sickening pain experienced, and there is inability to bear weight upon the limb; swelling succeeds and perhaps the skin becomes "black and blue". If a sprain be neglected, chronic inflammation of the joint may succeed, which may result in permanent stiffness of the part.

Treatment.—The great principle upon which a sprain is to be treated is rest. As soon as possible after the accident, immerse the injured foot or hand in a basin of hot water for ten minutes and then in a basin of cold water for a similar period. Then apply a wet bandage rather tightly from the toes or fingers well up beyond the injury; put the child to bed, and insist upon the most perfect rest. The bandage should be wetted at intervals with water or the lotion as in the case of a bruise, and should be loosened as swelling increases. When all pain and inflammation have subsided, the joint should be rubbed with a stimulating liniment. Gentle movements should commence on the third day, otherwise troublesome stiffness will ensue.

FRACTURES.

Fractures of the long bones of the limbs are fortunately of comparatively rare occurrence. The fracture of childhood is more often incomplete, or greenstick, owing to the elastic properties of the bone at this age, resulting in deformity of the limb, but not

complete separation of the fragments. The signs which lead to suspicion of a fracture are as follows :—

1. Absolute immobility and uselessness of the injured limb.

2. Pain always referred to the actual site of the fracture on the slightest movement; often there is a burning sensation of the skin over the broken ends of the bone.

3. Swelling characteristically rapid in development and of extreme degree. In young children and infants, the only sign may be a rapid obliteration of the dimples on the limb.

4. The late development, sometimes three or four days after the injury, of discoloration and bruising of the skin, which may extend over the greater part of the injured limb. The discoloured skin, in contrast to the blackened skin of an ordinary bruise, is quite free from tenderness except at the immediate site of the injury.

5. Distortion of the limb is an usual but not essential sign. In young children, complete fracture of a long bone may occur without any visible alteration in the shape of the limb, except swelling.

By such signs, we can recognise a fracture or the probability of a fracture and, by so doing, can save our patient from the further pain and possibly further damage by manipulations in search of enlightenment.

Management.—When it is suspected that a bone is broken, the greatest care must be taken, lest by incautious movements one of the ends be made to penetrate the skin.

First aid.—As soon as possible after the accident, should there be deformity, gentle efforts at reduction should be made. The limb above and below the site of the injury is grasped, preferably by separate individuals and gentle continuous traction is made in the line of the limb. On no account should other manipulations, such as "bending" movements, be attempted.

If the patient is at any distance from home, a dozen or so straight bamboo twigs should be cut and rolled in grass or pieces of cloth and placed at intervals around the limb, and there secured by tying them with two or three pocket handkerchiefs moderately tight. This done, the child may with safety be carried home, and a surgeon summoned. The straw cases in which wine bottles are usually packed serve excellently for those temporary splints, one being placed at either side of the fracture.

On reaching home, the child is placed upon a perfectly level and rather hard bed, and the limb is again examined for deformity and carefully measured for shortening as compared with the other side. Should examination reveal that the position of the limb is not yet satisfactory, the process of reduction, as detailed above,

should be repeated. The sooner after the occurrence of the accident reduction is made, the more easy will it be of accomplishment.

The next step is, retain the injured limb in the natural position to which it has been reduced, by means of splints, which must be sufficiently firmly applied to ensure immobility, while pressure on prominent points must not be too great. The most simple form of splints consists of pieces of thin light board cut somewhat longer than the broken limb. One of these, well padded, should be placed at either side of the broken limb, and, if desired, a third may be placed behind for it to rest upon. With three straps or pieces of bandage they should be bound firmly but not too tightly, in position around the limb.

In splinting a limb care should be taken to immobilise the joints above and below the injured bone in the position which affords most relief.

A special word of warning must be given about the use of splints. Splints and bandages applied soon after the accident and apparently comfortable may, by the subsequent swelling of the limb, become so tight that blistering or even ulceration of the skin is produced. Splints must therefore be examined every few hours for the first twenty-four hours after the accident. For the same reason, *padding must be loose over bony points and the heel especially guarded from injury.*

Modern opinion favours the daily removal of splints and massage of the limb, but this can only be undertaken by the expert. The *untrained assistant must let well alone,* contenting himself with a periodical inspection of the limb under the splints to ensure that the skin is not becoming damaged. In most cases it will be necessary to wear the splints for three or four weeks.

These directions are of the simplest nature; many fractures require special apparatus, but the limits here available do not permit of more than the most general allusions to the subject. In all cases it is very desirable that *a surgeon should inspect a fracture as soon after its occurrence as possible.*

When possible, X-rays should be employed both as an aid to diagnosis and in checking the position of the bone after splinting. Such measures are particularly desirable in children as there is a liability to displacement of the epiphysis or growing end of the long bones, which, if uncorrected, will lead to partial cessation of growth in the limb.

A COMPOUND FRACTURE, that is, when the broken bone has penetrated the skin and made a wound which communicates with the break, is to be treated in the same way—by reduction and splints—the wound being treated upon general principles (*see*

wounds), with tincture of iodine as mentioned above, and then carefully applying an antiseptic dressing. In these cases, the very greatest care should be taken that all dirt is removed, and that the neighbourhood of the skin wound is clean. Spirits of wine is the most efficient cleanser of the skin. All dressings which are applied must be sterilised by being boiled in a kettle for ten minutes and then when cool applied. If the most rigorous care be not taken, the child may lose the limb or life from gangrene or acute poisoning. In every possible case surgical aid should be called to a compound fracture.

INJURIES TO THE HEAD.

In childhood, the skull is elastic and well adapted to encounter the falls and blows which are inseparable from that period.

Occasionally, however, the child sustains a blow of sufficient degree to cause concussion, that is to say, the child is rendered unconscious for a varying length of time. During unconsciousness, all functions are to some degree suspended, the child is cold, the temperature subnormal, the pulse feeble and the respiration shallow. In the stage of recovery there may be signs of cerebral irritation, the child lies curled up, turned away from the light and resents any interference. As the child revives, vomiting is to be expected, but is of no significance unless it becomes persistent, in which case, it is to be regarded as a sign of more severe injury.

Every child who has been rendered definitely unconscious, even though for a short time only, should be treated as a case of concussion, lest troublesome after-effects, such as headache or even grave inflammation, set in. Many cases of tuberculous meningitis are referred to some blow or fall, and though it is probable that in the majority the blow was incidental, it is at the same time to be expected that such injuries temporarily lower resistance to infection.

The child should be put to bed in a darkened room, with an ice-bag or cold application to the head. If there is collapse, hot bottles are placed at the feet and sides. Absolute quiet should be maintained and the recovery of the consciousness awaited. On no account should stimulants be given.

In all cases of head injury, the administration of a purgative may be regarded as essential. If the child is unconscious, calomel in appropriate but free dosage may be put at the back of the tongue. Of all aperients, magnesium sulphate is the most valuable in such conditions and should be given daily so long as symptoms continue in doses sufficient to maintain a free watery evacuation.

Rest in bed must be adequate, ten days for the more mild cases and for some time afterwards care must be taken that the child does not join in active or boisterous play. More serious injuries may occur to the skull should the child fall from a height or be struck heavily. In such cases, there may be bleeding from the nose, the ears or under the eye, indicating that the base of the skull is fractured or there may be dinting or fissuring of the vault.

The symptoms are commonly due to hæmorrhage within the skull or actual pressure from the dinted bone.

When such damage is present, unconsciousness is deep, the respiration is irregular and snoring, the pulse is slowed and there may be convulsions. Early treatment will be on the lines laid down above and skilled surgical aid will be sought without delay. If there is bleeding from the ears, they should be gently cleaned with cotton-wool soaked in Condy's lotion or other suitable antiseptic and the ear lightly plugged with aseptic gauze. In all cases of head injury, expert advice is desirable, and in the more severe cases it is essential.

SNAKE-BITES, STINGS OF INSECTS AND BITES OF ANIMALS.

Snake-bites.

There are seven common fatally poisonous snakes in India:—the Cobra, the King Cobra, the Krait, the Banded Krait (not always fatal), Coral snakes, Russell's Viper and the Echis Viper.

In addition to this, there are several varieties of Viper whose bite, though virulent, is not usually fatal. Perhaps the most common of these is the small green Pit Viper or Bamboo snake.

The majority of bites from snakes in India are due to non-poisonous snakes, and the average untreated mortality rate from snake-bite in India is about 6 per cent. of all persons bitten (R. Knowles).

The venom of Cobras and Kraits kills by causing asphyxia. There is œdema and paresis at the site of the bite. The general symptoms are ptosis, inco-ordination of speech, falling of the head, paralysis of all the voluntary muscles; later shallow, rapid and failing respiration; swelling of the tongue and salivation. Nausea and vomiting are common. Death occurs in from thirty minutes to thirty hours after the bite.

Viperine venoms kill by causing hæmorrhages from all mucous membranes, and under the skin. There is great and persistent pain at the site of the bite, and persistent oozing of hæmolysed blood from the bite. With big doses of venom, death may occur within a few hours from cardiac failure, due

to vaso-motor paralysis. With small doses there are hæmorrhages from all mucous membranes and under the skin. Extensive local gangrene may occur, or secondary septic infection. Death occurs from cardiac failure, usually within a few days of the bite (Knowles).

Treatment.

The immediate treatment after the bite of a poisonous snake has one object only; that is, to prevent or rather, to delay the spread of the poison from the bite to other parts of the body long enough to permit of skilled treatment. For this purpose, a ligature of cord *is tied round the limb two to three inches above the bite.* A piece of stick is introduced under the cord and by twisting the ligature is tightened. A second ligature is applied some four inches above the first. The ligature must compress the tissues against a single bone. A ligature between the knee and the ankle cannot form a complete block as there is uncompressed tissue between the two bones.

The patient is taken to the nearest hospital without delay. Should it be impossible to obtain medical treatment, the wound will be scarified by cutting across the tooth puncture to the depth of a quarter of an inch and blood encouraged to flow. Crystals of potassium permanganate or pure carbolic may be applied to the wound.

Stimulants in the form of brandy, sal volatile or strong black coffee are given and the patient kept quiet and warm. After some twenty minutes it will be necessary to relax the ligatures, otherwise the limb will mortify.

In case of poisoning by the Vipers, blood may ooze from the wound for hours or days. A good astringent for local use is two teaspoonfuls of alum in a tumbler of water.

The capture of the snake and the proof that it is harmless or comparatively harmless will do much to alleviate anxiety and neutralise that collapse which may be due to fear of impending death rather than to actual poisoning.

The account of further treatment, here appended, is taken from the chart "The Poisonous Snakes of India", Lieut.-Col. R. Knowles, I.M.S. [Messrs. Thacker, Spink & Co. (1933), Ltd.]. Those interested in the identification of the poisonous snakes may obtain the chart from the publishers.

1. Apply a tourniquet. The best type of tourniquet is narrow rubber pressure tubing. It should compress all the tissues against a single bone, e.g., in bites on a finger, the tourniquet should be applied round the base of the finger, with a second perhaps above the elbow; in cases of bite on a toe apply one

tourniquet round the base of the toe, and a second above the knee. The patient will be able to stand the tourniquet on for about twenty minutes, but not longer.

2. If possible, kill and identify the snake which bit. If (as is quite often the case) it is a harmless snake, the tourniquet may be released, and the patient dismissed. If it is one of the above seven, immediate measures must be taken. If one cannot get the snake, one can only judge by the symptoms whether it was a poisonous one or not.

3. If a patient is bitten on the finger or toe by a lethal snake, and is seen within ten minutes of the bite, immediate amputation will save life. If more than ten minutes has elapsed, amputation will be useless.

4. The substance which most rapidly and most certainly destroys snake venom is gold chloride, which is stocked in 15-grain tubes by most photographers and chemists in India. Unfortunately, it also destroys tissues, and its use is apt to be followed by local sloughing. It should, therefore, only be used for cases of Cobra, King Cobra, Krait and Russell's Viper bites. Dissolve six grains of gold chloride in half an ounce of water in a small test-tube by the aid of heat (3 per cent. solution). Fill a 2 c.c. hypodermic syringe with this, and by injecting into several points at the site of the bite, try to infiltrate the whole site of the bite. Everything depends on how successful one is in getting at and destroying every particle of venom injected. On no account should any incision be made, as it will let out more gold chloride solution than venom.

An alternative remedy is hypochloride of lime. Dissolve five grains of *fresh* bleaching powder in half an ounce of water. Fill a 2 c.c. hypodermic syringe with the solution, and by injecting at several points into the site of the bite, try to reach and destroy all the injected venom.

5. Inject Kasauli antivenene intravenously. Antivenene is four times more potent when given intravenously than when given subcutaneously. It should be given in *large* doses, e.g., 80 c.c. or more. Up to 160 c.c. is readily tolerated by the body. Next release the tourniquet.

6. Put the patient to bed. Administer cardiac stimulants if necessary. Next commence a careful watch for the onset of symptoms (as above) of venom intoxication. If they set in, go on administering further 20 c.c. doses of antivenene intravenously at half-hour intervals. In cases of Cobra bite, if breathing stops, try artificial respiration.

7. In cases of Viper bite, be prepared for the onset of hæmorrhages, and if these appear, try the effects of adrenalin

subcutaneously, intravenous injection of calcium salts, horse serum, hæmostyl, etc. In cases of Russell's Viper bite, gangrene may set in subsequently, and necessitate amputation.

8. In cases of recovery after local injection, a slough will probably form at the site of the bite, and the wound must be carefully dressed daily with antiseptic dressings until it heals.

STINGS AND BITES OF VENOMOUS INSECTS.

In young children may not be altogether unattended with danger.

Treatment.—Tie a ligature above the place, if possible. Extract the sting if it can be seen, suck the wound, and then apply liquid ammonia, which will at once relieve a *wasp* sting. Sal volatile will also answer, but not so quickly. If neither is at hand, use a strong solution of bicarbonate of soda or carbolic oil. If swelling has already set in, do not use the ammonia, but the soda solution on a rag.

Mosquito bites are relieved by the application of oil of peppermint, and the oil of eucalyptus is a good preventive. For the inflammation which sometimes follows these bites, a poultice of ipecacuanha powder and mint leaves is very good, or ipecacuanha alone made into a paste.

An application as follows will be useful when bites are attended with much irritation :—Chloretone grains 10, hazeline 1 drachm, carbolic acid minims 4, alcohol 2 drachms, water to one ounce.

For *scorpion* stings, ligature as above, suck the part and apply a drop of carbolic acid. If the acid be put into a little cut made into the punctured spot, so much the better; afterwards poultice with ipecacuanha paste. Sal volatile and brandy should be given if there is faintness in any of the above cases.

BITES OF RABID ANIMALS.

There is reason to believe that all warm blooded animals are susceptible to rabies (hydrophobia), though the dog and the jackal are the two common agents of transmission to man. *When the bite of an animal is sustained, there are two matters for immediate attention, the first, the cauterisation of the wound, the second, whether Pasteur treatment is necessary,* that is, if the animal is mad and if it has infected the patient.

For the first, pure carbolic acid or pure formalin is employed. It is essential that the caustic be made to penetrate the lowest depths of the wound, which should afterwards be dressed aseptically and not sutured. Next, attention is directed to the

animal which has inflicted the bite; if obviously rabid and uncontrolled, it should be destroyed before it does more damage, but when possible, it should be tied up and kept under observation so that the diagnosis may be confirmed.

Signs of a rabid dog.—The problem more often arises with pet dogs; it is not realised for some little time that the dog is mad and in the meantime it has been allowed loose and handled by the owners. The earliest sign is a change in disposition, disobedience, shyness, the dog is restless and tends to seek shelter in dark corners. The popular conception of the rabid dog is by no means always the rule, instead of being fierce and aggressive, the dog may become even more affectionate, but there is always a perceptible change in the character. The voice also is changed, the dog may howl with a note quite unlike its own or even unlike the howl of any dog. Later, all voice is lost. Not infrequently an early sign is difficulty in swallowing together with accumulation of saliva in the throat. This causes the dog to paw at the mouth and gives rise to the suspicion that there is a bone stuck in the throat. The owner will then explore the throat, putting his hand inside the mouth, and so unwittingly expose himself to infection if he has open sores on the hand.

A paralysis, often accompanied by convulsions, soon sets in, the tail droops, the hind quarters sway and become powerless, so that the dog cannot rise.

It should be mentioned that in spite of the name hydrophobia, fear of water is not a sign of the disease, rather will the dog make every effort to drink, but is unable to do so on account of paralysis of the throat. Frothing at the mouth again, though common, is not invariable.

The illness lasts from three to five days and ends in death. When there is any doubt, the brain may be removed by someone competent to do so and sent to the nearest Pasteur Institute preserved in rectified spirit or formalin solution one in ten. It is wiser that those bitten should not wait for the confirmatory report, but should proceed to the institute and begin treatment, which may be stopped if it turns out that the dog was not rabid.

Infectivity.—The saliva of the rabid dog is infective three days before any signs of rabies occur, but owing to the short term of life once the disease has set in, *if the dog is alive and well ten days after the infliction of the bite, there is no fear of infection.*

Treatment is not considered necessary if the bite has not broken the skin. Again, if the saliva has fallen on the skin, there is no fear of infection provided there are no fresh abrasions. The hands of those who have handled rabid dogs must therefore be carefully examined with a magnifying glass for cuts and

abrasions and it should not be forgotten that tne soiled fingers may convey infection to abrasions elsewhere.

Only a small proportion of those bitten by actually rabid dogs become infected. *The Pasteur treatment is a practically complete safeguard, but there should be no unnecessary delay in submitting to treatment, especially if the bite is on the head or face.* The Pasteur Institutes in India are at Kasauli, Calcutta, Coonoor, Shillong and in Burma, Rangoon. Recently, centres for treatment have opened in most large towns.

It will interest owners of valued dogs to know that they also can undergo preventive inoculation if bitten by other rabid animals, but as the treatment sometimes fails, all precautions should be taken, and the dog tied up for six months in strict quarantine.

CHAPTER XXXII.

ACCIDENTAL POISONING.

In all cases of poisoning actual or suspected, it is preferable that the victim should be rushed to the nearest hospital as all apparatus and antidotes necessary for treatment will there be available. Any suspected material should be taken with the patient.

If it is decided to call the doctor, explain fully the circumstances of the case to enable him to bring the appropriate remedies and appliances.

Do not leave the patient alone even when he has apparently recovered. Often enough after the circulation improves the symptoms reappear probably from the reabsorption of the poison (Murrell).

Poisons are of three kinds:—

1. Corrosives, which have a local burning action.
2. Irritants { metallic, vegetable, animal } which cause local inflammation.
3. Nerve poisons which act chiefly on the nervous system.

Examples of corrosives are: corrosive sublimate, the mineral acids, ammonia, carbolic acid, oxalic acid; of the irritants: arsenic, antimony (metallic), croton oil (vegetable), and iodine; of the nerve poisons: opium, chloral, camphor and belladonna.

The symptoms of the corrosives are: burning pain of the mouth, gullet and stomach, extending soon over the whole belly; the abdomen swells, and collapse ensues. Of the irritants: after an interval, a burning constriction of the mouth, gullet and stomach, which latter is tender to pressure; nausea, thirst and vomiting follow, generally accompanied by purging and fever; the pulse fails, and the body becomes cold and clammy. Of the nerve poisons: some produce deep sleep (opium, chloral, camphor), some noisy delirium (belladonna) others cause convulsions, *e.g.*, strychnine.

In most cases the following means will be adopted:—

1. The evacuation of the stomach by emetics or the stomach tube.
2. The administration of antidotes.
3. The prevention or treatment of collapse, and
4. The relief of pain.

1. (*a*) Emetics are for the purpose of inducing vomiting and are selected with care according to the type of the poison. As the majority of emetics are irritant in nature they are not suitable for use in cases of irritant poisoning. In some cases the poison itself has definite emetic powers. The safest emetic for household use is common salt, a tablespoonful to a tumbler. Ipecacuanha wine is somewhat uncertain and is depressing, but when recommended is used in doses of from one to four drachms according to age. Special emetics are used where indicated only: Zinc sulphate, grains 3 to 5 in 1 ounce of water for a child from 1 to 5 years of age, copper sulphate grains 1 to 3 in 1 ounce of water and mustard two drachms to 6 ounces of water.

(*b*) The stomach tube is the most practical way of emptying the stomach and when *in situ* may be used either to wash out the stomach or to administer antidotes. It should not be used in cases of corrosive poisoning or in the late stages of acute irritant poisoning. It need hardly be said that its use is limited to the expert. In children the ordinary stomach tube is too large and we employ a catheter, No. 8 or No. 12 according to age, connected with a piece of rubber tube and a glass funnel.

2. Antidotes are remedies which form chemical combinations with poisons to render them harmless. For example, chalk or lime in the case of mineral acids, white of egg or milk in the case of corrosive sublimate.

3. The prevention and treatment of collapse consists in administration of warmth, friction and such stimulants as are indicated under their appropriate headings.

4. For relief of pain. Firstly we have the demulcents such as white of egg and olive oil which form a coating and give protection to the irritated or corroded mucous membrane. Secondly we are not infrequently called upon to employ morphia, which should be limited so far as possible to children over the age of five, at which age a hypodermic injection of from grain $\frac{1}{12}$ to $\frac{1}{16}$ may be given. To the baby suffering from collapse after poisoning morphia should never be given.

SOME SPECIAL POISONS.

Arranged alphabetically with their symptoms and treatment.

Name and how taken.	Symptoms.	Treatment.	Remarks.
Acids, Mineral. Sulphuric (vitriol), nitric and hydrochloric (muriatic). By mistake for something else.	Violent burning pain in mouth, gullet, and stomach. Vomiting of shreddy membrane and blackened blood. Thirst. Constipation. Loss of voice. Difficult breathing and swallowing. Mouth and throat white or yellow coloured. Collapse.	Avoid stomach tube. Chalk, soda (washing soda if no other), carbonate of potash or magnesia. Dilute and give freely. Wall-plaster and water. Soap and water. Seize the nearest remedy. Drinks of olive oil, white of egg, barley water, or arrowroot. Morphia injection (*see* Introduction).	These are "corrosives", but if taken diluted they are only "irritant", and not so dangerous. Any alkali is an antidote. May be immediately dangerous by causing swelling of the throat and suffocation.
Aconite ***or*** ***Monkshood.*** Liniment in error. "Pain-killer".	In three minutes a tingling, numbing pain of mouth, lips and tongue. Numbness of the skin. Often retching. Paralysis first of the legs, then of the arms. Failing pulse and respiration. Collapse. Mind clear throughout.	Mustard emetic, one to two teaspoonfuls in six ounces of water. Wash out the stomach with potassium permanganate grs. 2 to one pint. Injection: Atropine grain 1/300 and Strychnine grain 1/240. Alcohol and sal volatile. Tincture digitalis. Dose, 5 minims every ½ hour, thrice (for child of five) in water. Recumbent position and absolute rest. Friction to the limbs. Artificial respiration.	Aconite is often *combined with belladonna* in liniments. Treatment, the same.

Ammonia. Liniment in error. "Liquid ammonia". "Compound camphor liniment".	Burning of mouth, throat, chest and stomach. Mouth bleached inside. Cough. Bloody saliva escaping. Voice lost. Pulse failing. Cold limbs. Danger of suffocation.	Avoid stomach tube or emetic. Vinegar largely diluted, freely. Followed by draughts of olive oil, melted butter, white of egg with water or barley-water. Morphia $\frac{1}{12}$ to $\frac{1}{16}$ grain (*see* Introduction). Tracheotomy sometimes necessary.	
Antimony. Tartar emetic, pure or ointment.	Incessant vomiting, faintness, and clammy perspiration. Burning of throat and stomach. Violent purging. The vomit and stools may be bloody. Cramps and collapse.	Draughts of water. Tannic acid, 10 to 15 grains in water, repeated if vomited (tincture of bark, catechu, or even strong tea), followed by white of egg and barley water. Morphia as above if necessary. Stomach tube, wash with water. Stimulants.	Tannin (or anything containing it) is the antidote.
Arsenic. Fowler's Solution. "Rough on Rats". Fly-papers. Arsenical soap. White arsenic used by builders.	In ½ hour, faintness, nausea and burning of stomach. Vomiting which may be tinged with blood. Cramps in legs. Great thirst. Belly tender. Straining and bloody purging. Clammy skin. Collapse.	Wash out stomach with plain water. Antidote:— (1) Tincture ferri perchloride, 3 drachms, water to 6 ounces. (2) Sodium bicarbonate ½ ounce, water two ounces. Mix (1) and (2) and administer.	Less than a grain might be fatal. Fowler's solution contains 1 grain in 100 drops.

SOME SPECIAL POISONS—(*contd.*).

Name and how taken.	Symptoms.	Treatment.	Remarks.
		Dialysed iron (a dessertspoonful or more), well diluted and repeated; or, in its absence, carbonate of magnesia or olive oil freely. Barley water and white of egg with water. Hot blankets and bottles. Frictions.	
Belladonna or Atropine. Eye-drops in error. Liniments. Extract of belladonna. Berries of the plant.	Dryness and heat of throat. Flushed face. Great thirst. Widely dilated pupils. Mirthful delirium. Staggering gait. Deep sleep.	Stomach tube, wash out repeatedly with potassium permanganate solution. Brandy, sal volatile, chloric ether. Tannin, freely. Strong tea or coffee (mouth or enema). Artificial respiration. Injection: Pilocarpine, grain 1/50.	Known as "deadly nightshade". Children bear large doses well. When *belladonna and opium combined* in a liniment are taken, treat as for opium (which see).
Camphor. Eaten from lump for colds. Essence or spirit of camphor.	Odour of breath. Giddiness. Faintness. Delirium. Cold, clammy skin. Difficult breathing. Deep sleep. "No pain, no purging, no vomiting" (Murrell).	Stomach tube, wash out with water. Saline purge. Sal volatile. Warm blankets and hot bottles. Cold and hot douches to head and chest.	Alcohol not to be given by the mouth if solid camphor has been taken, because it would dissolve it. May give brandy by enema if necessary.

Carbolic Acid. Lotions in error. Dressings and oil by absorption.	Burning of mouth. Inside of mouth white and shrivelled. Odour from breath. Cold, clammy skin. Lips and eye-lids livid. Urine inky-coloured. Pupils contracted. Deep insensibility.	Two or three teaspoonfuls of Epsom salts in tumbler of water. A soft stomach tube is permissible; wash out with Sodium and Magnesium Sulphate solution. More Epsom salts at intervals. Followed by olive oil and castor oil mixed and white of egg in water, freely. Stimulate with brandy, sal volatile and chloric ether.	The patient should be retained in hospital for a few days at least in case late signs of damage to the kidney develop.
Caustic Lundr.		*See* Silver.	
Charcoal Fumes. (Carbonic acid gas.) Charcoal fires in closed apartments.	At first headache, giddiness and drowsiness, succeeded by insensibility, with a livid face.	Removal into fresh air. Stimulants by mouth or bowel. Artificial respiration. Oxygen combined with Carbon dioxide.	Common among the natives of India.
Chloral. Sedative syrup. Patent medicines.	At first a natural sleep, which deepens into coma. Livid face. Failing pulse. Low temperature. (Murrell says it may fall to 91 degrees.) Pupils contracted at first, afterwards dilated.	Stomach tube or emetic of mustard. Sal volatile, alcohol and ether as stimulants. Strychnine hypodermic injections. Hot bottles and blankets applied. Strong hot coffee as enema. Artificial respiration. Oxygen.	An overdose might prove dangerous to a very young child.

SOME SPECIAL POISONS—(*contd.*).

Name and how taken.	Symptoms.	Treatment.	Remarks.
Copper. Sulphate of copper (blue stone) lotion. Copper cooking utensils (verdigris).	Metallic taste. Constriction of the throat. Vomiting, griping and straining. Purging. Difficult breathing. Great thirst. Insensibility and perhaps convulsions. Later jaundice and hæmaturia.	Stomach tube if no signs of burning of mouth, followed by white of egg and milk freely. If severe cramps, give morphia. Poultice abdomen. Stimulants.	The proper "tinning" of cooking utensils is important. Acids should not be cooked in copper vessels. This is not a likely cause of acute poisoning. A sufficient dose acts as an emetic.
Corrosive Sublimate. Lotion in mistake, or ointment.	Metallic taste and feeling of constriction in the throat. Pain in stomach. Vomiting of bloody mucus, bloody purging. Pulse very weak and rapid. Skin cold and clammy. Urine suppressed. Convulsions.	Tube, if early. White of egg with water, copiously. Failing eggs, use flour and water, or milk and lime-water. Stimulants as required. Sodium thiosulphate by mouth and intravenous.	The lotion has the appearance of water and very little taste.
Croton Oil. Mistaken for castor oil. Liniment swallowed.	Severe pain in stomach. Copious watery purging. Vomiting. Face pale. Faintness. Cold skin.	Purging is so violent that emetics are useless. Drink freely of barley water or white of egg and water, or arrowroot.	

		Stimulants (brandy, sal volatile and chloric ether). Morphia. Hot fomentation or hot bottle to stomach. Strychnine injection.	
Fly-Paper.		*See* Arsenic.	Chewing the paper, or drinking the water in which it lies.
Fowler's Solution.		*See* Arsenic.	Mistake for something else.
Hyoscyamus. (Henbane).		Treat as for belladonna.	Overdose.
Iodine. Tincture or liniment.	Pain and burning in the throat and stomach. Vomiting and purging. Faintness; possibly convulsions.	Starch (arrowroot or any flour) in water freely (given raw and cold). A small dose of morphia if much pain. Wash out the stomach with sodium bicarbonate two drachms, water four ounces.	Not often fatal. The vomited starch-water will be blue.
Kerosene Oil.	Pain in stomach. Vomiting and purging. Unconsciousness, rapid respiration and pulse. Blueness of face and hands.	Wash out stomach with plain water. Strychnine. Warmth. Hot coffee by the rectum. Demulcents such as olive oil. Artificial respiration.	

SOME SPECIAL POISONS—(*contd.*).

Name and how taken.	Symptoms.	Treatment.	Remarks.
Lead. Sugar of lead is sweet. Goulard's extract. White lead mistaken for chalk. Lotion swallowed.	Metallic taste. Great thirst. Severe colic relieved by pressure. Constipation. Cramps. Cold sweats and convulsions.	Emetic (mustard, zinc or ipecacuanha), zinc the best because it is an antidote too. Zinc sulphate grains 3 to 5, water to one ounce. Epsom salts in water freely. Milk and white of egg to follow. Poultice belly. Morphia if severe pain. Afterwards iodide of potassium in mixture.	Not at all so poisonous as is generally supposed.
Lucifer Matches.		*See* Phosphorus.	The heads may be eaten in play.
Morphia.		*See* Opium.	
Mushrooms.	In ½ hour or more, colic, followed by vomiting and diarrhœa. Pulse becomes very weak. Mental excitement. Insensibility.	Emetic of mustard, zinc or ipecacuanha. Tincture of belladonna (5 drops every ½ hour for three doses to a child of five) or atropine sulphate injection, grain 1/300. Castor oil. Stimulants (brandy, sal volatile or ether). Warmth to surface, Poultice belly.	Muscarin poisoning.

Nitric Acid.		*See* Acids, mineral.	
Nux Vomica.		*See* Strychnine.	
Opium. Solid lump. Laudanum. Soothing syrups. Battley's solution. Enema. Poultices or liniments by absorption. Dover's powder.	Pupils contracted. Face livid. Skin dry. Insensibility, which becomes very deep with heavy breathing. This is succeeded by great prostration, shallow breathing and general clammy perspiration.	Emetic of mustard or zinc. Strong coffee or tea liberally. Tincture of belladonna (5 drops to a child of five, every ½ hour for three doses), or atropine sulphate grain 1/300 with strychnine grain 1/240 injection. Wash out stomach with potassium permanganate two grains to a pint of warm water. Repeat after one hour. The bowel should also be washed with the same solution. Artificial respiration. Oxygen and carbon dioxide.	Often *combined with belladonna* in a liniment, then treat as for opium, but do not administer belladonna. Infants are very easily affected by opium. Two drops of laudanum and one grain of Dover's powder have caused death.
Oxalic Acid. Mistaken for Epsom salts. "Salt of Sorrel" for removing iron mould.	Burning pain in throat and stomach, vomiting of bloody matter, imperceptible pulse and great depression. Mouth may be white inside.	Stomach tube or emetic forbidden. Chalk, whiting or lime freely with water. The saccharated solution of lime in half teaspoonful doses frequently in water is the best. Castor oil and olive oil afterwards.	Very poisonous. Must *not* give the alkalies of potassium or sodium as they form poisonous compounds with the acid. The purely acid taste might attract a child.
Pain-Killer.		*See* Aconite.	

SOME SPECIAL POISONS—(*contd.*).

Name and how taken.	Symptoms.	Treatment.	Remarks.
Paraffin.		*See* Kerosene.	
Petrol.		*See* Kerosene.	
Phosphorus. Rat-paste poison. Match-heads.	Burning pain in the stomach. Vomiting, which may contain blood. Delirium. Deep insensibility or convulsions. The patient may recover from the local symptoms, the graver symptoms not appearing for a couple of days.	Emetic—copper the best, as it is also an antidote. Stomach wash, potassium permanganate. Repeat it (stomach wash). Epsom salts as purgative, avoid castor oil.	All oily and greasy substances to be avoided when treating a case.
Rat-paste Poison.		*See* Phosphorus.	
Rough on Rats.		*See* Arsenic.	
Salt of Sorrel.		*See* Oxalic Acid.	
Silver; Nitrate of (Lunar Caustic). Portion falling down throat during an application.	Vomiting of white flaky matter, which turns black on exposure.	Common salt in water or milk, repeatedly, in large quantities. White of egg with water freely afterwards.	A small quantity taken is rendered harmless by the gastric juice. The antidote, common salt, acts in a similar way.

Strychnine. Mistaken for santonin or salicin. Some rat poisons (Simpson's paste, Butler's vermin-killer).	Convulsions and lockjaw. Body bent backwards. Countenance wildly excited. Pulse rapid and small. Respiration difficult.	Chloroform may be given till it is possible to wash out the stomach with tannic acid, grains 2, to water one ounce. Chloroform also to control convulsions. Absolute rest in quiet dark room. Bromide and chloral by bowel and repeated to keep the convulsions in abeyance. Artificial respiration.	The active principle of nux vomica. One-sixteenth of a grain has killed a child of two. Twenty grains of a nux vomica nut would be dangerous.
Sulphuric Acid.		*See* Acids, mineral.	
Tartar Emetic.		*See* Antimony.	
Tobacco. (including Lobelia).	Nausea, vomiting and faintness. Confusion of sight. Clammy skin and weak pulse.	Emetic of mustard. Tannic acid, ten grains or so in water frequently, or strong tea. Stimulants—brandy, sal volatile and chloric ether. Warmth to surface of body. Recumbent position.	
Turpentine.	Burning sensation in mouth and stomach. Vomiting and diarrhœa. Collapse and coma. Suppression of urine or blood in urine.	Stomach tube or emetic, followed by white of egg. Stimulants. Morphia injection.	

SOME SPECIAL POISONS—(*concld.*).

Name and how taken.	Symptoms.	Treatment.	Remarks.
Vermin-killers.			
Battle's.		*See* Strychnine.	
Butler's.		*See* Strychnine.	
Gibson's.		*See* Strychnine.	
Simpson's.		*See* Arsenic.	
Roth and Ringeisen's.		*See* Phosphorus and Arsenic.	
Rough on Rats.		*See* Arsenic.	
Zinc Chloride.			
Burnett's fluid. Disinfecting fluid.	Corrosion of lips and mouth. Pain and burning of stomach. Constant vomiting of bloody fluid. Difficulty of swallowing and breathing. Quick, feeble pulse, deep insensibility.	Carbonate of soda in large quantities dissolved in warm water (common washing soda will do). Milk and white of egg very freely. Tannic acid or strong tea. Morphia injection. Linseed poultice to stomach.	

CHAPTER XXXIII.

THE ADMINISTRATION OF REMEDIES.

It is well to approach the subject of the administration of remedies to children with the full realisation that medicines are but the second line of defence against disease, the first being maintained by careful attention to the dieting and hygiene of the child. Even in sickness, particularly in the diseases of early infancy, our first consideration is whether we cannot cure the disease by such measures as the correction of dietetic errors before seeking the assistance of drugs.

The discrete and timely administration of medicinal remedies will, however, produce effects more rapidly beneficial than in the adult and will also, in many cases, prevent further development or aggravation of illness.

For home medication, only the simplest and mildest of remedies should be employed. Patent or other medicines of unknown composition should not in any circumstances be permitted. Further, the practice of borrowing prescriptions written for other children, on the assumption that what has benefited one child will benefit another, is unreasonable and dangerous.

There are certain *drugs* which, when taken by the mother, are *secreted in the milk* in sufficient quantities to affect the child. The most conspicuous among these are :—the salicylates, belladonna, atropine, arsenic, iodine in any form, potassium iodide, bromides, the saline purges and possibly opium and morphia. Such drugs, therefore, should be used in strictly controlled doses and only when absolutely necessary by the nursing mother.

Whatever medicine is necessary for the child, it should be made up so as to occupy the smallest bulk possible and as free from objectionable taste as the nature of the contents permits. It is a matter of the greatest difficulty, even of impossibility to give a complete list of the correct doses of drugs for infants of all ages. Individual susceptibility, the condition of the child and other factors must inevitably render variation necessary. In some instances, in order to produce the desired effect, it may be necessary to push the dose beyond the standard safety limit; but of course, such procedures must only be undertaken under medical guidance.

The secret of safety in the use of dangerous drugs lies in the administration of initial doses well within the safety limits and increase only after the effect has been observed and the individual tolerance of the patient ascertained.

A short note on the medicines more commonly employed, grouped according to their action, is now appended :—

ANTHELMINTICS are medicines which have the power of destroying the life of intestinal worms. They are commonly administered in conjunction with a purgative, to ensure the rapid passage of the drug and to expel the dead worm. For each species of worm there is a specific remedy which is powerless against other species; consequently we must be aware of the type of infection before embarking on treatment. It is also clear that the so-called worm powders sold as an universal remedy are in many cases useless (*see* also Chapter XV).

ANTIPYRETICS OR FEVER MIXTURES act by promoting a free flow of perspiration and urine. For mild degrees of fever, the simple fever mixture of the type of No. 21 is perhaps the most satisfactory. The effect may be enhanced by judicious warm bathing or sponging.

The coal-tar derivatives such as aspirin and antipyrin (phenazone) are more powerful in their action. Their use, however, in the very young is not altogether free from danger. These drugs have the additional attribute of relieving many forms of pain and restlessness. Phenazone especially is of value in the control of the spasmophilic tendency (*see* Chapter XIV). Full details regarding the control of fever by hydrotherapy will be found in Chapter XXI.

ANTISPASMODICS AND SEDATIVES are medicines in frequent demand to neutralise that excessive excitability of the nervous system which is such a common feature in the illness of infancy and childhood. Of this class, the bromide of potassium is an effectual and at the same time safe remedy for the parent to handle. With it harm can hardly be done unless there be utter recklessness and disregard of the effects. The continued use of bromides may induce a severe and even disfiguring eruption. In most cases, this amounts only to the appearance of red blotches, which soon vanish when the medicine is stopped, but occasionally these blotches develop into pustules or wart-like growths.

Chloral is a more powerful sedative and must consequently be used with caution; the dose advised in prescription No. 25*a* is safe and may be repeated after six or eight hours should there be necessity. When combined with the bromides it acts more powerfully.

Mention has been made above of the value of phenazone. The drug is especially indicated in cases in which there is a persistent tendency to convulsive manifestations.

ARSENICAL PREPARATIONS occupy an important place in the formulary of childhood. The indications for the use of the drug are as follows :—

1. As a stimulus to blood formation; it is therefore indicated in anæmia and after debilitating diseases.
2. As a parasiticide in malaria, amœbiasis, relapsing fever and in certain specific diseases.
3. In certain nervous diseases, especially those expressed by muscular spasm or uncontrolled action such as chorea, asthma, croup or whooping-cough.
4. In certain skin diseases.

The usual form and dose is liquor arsenicalis or Fowler's solution, of which from ¼ to 1 minim may be given to a child of one year three times a day, but in certain diseases, notably chorea, larger doses are required. When arsenic is given in heavy doses, the most careful watch must be kept for signs of poisoning, sore eyes, vomiting, tenderness of the abdomen and skin rashes. Arsenic being a cumulative drug, it is important that the course should be interrupted periodically, at the end of a fortnight or three weeks, and an interval of ten days allowed, during which the system will get rid of the excess.

Of late years, the organic preparations of arsenic such as neosalvarsan, sulfarsenol and stovarsol have taken the place of the inorganic compounds when large doses are required.

ASTRINGENTS.—The term is somewhat erroneously applied to all classes of drugs employed in the control of diarrhœa. More correctly the term should be applied to those drugs which by direct or indirect application cause a contraction of the blood vessels. Examples of such drugs are tannic acid, tincture of ferric chloride, catechu, zinc sulphate (for eye application) and adrenalin. For the control of diarrhœa, it is preferable as a rule to use drugs having different actions, those having an antacid and soothing effect on the mucous membrane, such as bismuth carbonate or chalk powder and those which control the over-action of the musculature of the bowel, belladonna and opium. The latter is reserved for more severe or special cases in children.

It cannot be too strongly emphasised that the immediate administration of such medicines in the diarrhœa of children is bad practice. The diarrhœa is symptomatic and calls for a careful investigation and removal of the exciting cause.

Bael fruit is classed among the astringents, but its action is that rather of a general regulator of the bowels. In irregularity

presenting alternations of diarrhœa and constipation, one draught (*see* prescription No. 10) taken early in the morning often exercises the most beneficial effect.

In bazaar specimens, the wood-apple (fruit of the *Feronia dephantum*) is often substituted for bael. Though they bear a close resemblance externally, they can easily be distinguished by opening them. In the true bael there are, in the centre of the pulp, a number of cells, from five to eighteen, containing one or more seeds and glutinous mucus, whilst in the wood-apple, there are no cells and the seeds are embedded in the pulp.

When the fresh fruit is not procurable, the liquid extract of bael or the dried bael can be obtained from the chemist.

Of local astringents for the checking of bleeding from a wound or from the nose there is none more valuable than ice. For internal hæmorrhage such as from the lungs or within the abdomen or for deep inflammation or congestion, as for example in meningitis, the application of the ice-bag brings relief in a manner in which no other therapeutic agent can.

When ice is not obtainable, the following freezing mixture may be employed:—Sal ammoniac 5 ounces, saltpetre 5 ounces, water 10 ounces mixed together and enclosed in a bag.

CALCIUM.—The colloidal form or the salts play an important part in modern therapy. Calcium deficiency is largely responsible for certain functional disorders of the nervous system (*see* spasmophilia and rickets). An adequate supply must always be maintained during prolonged fevers. Its administration during such fevers is of great value in controlling delirium. It is also employed in allergic reactions and for the control of hæmorrhage.

CARMINATIVES stimulate gently the nerves of the stomach and relax its orifices, facilitating the escape of gas and relieving spasm. They are, therefore, useful for flatulence and, when combined with aromatics and soda, they are of great value both in colic and in certain kinds of diarrhœa.

EMETICS play a less conspicuous part than formerly in the treatment of children. Their purpose is to empty the stomach promptly of its contents but in practice this is often difficult to achieve without causing serious depression or irritation to the stomach. Further, the emetic drugs are uncertain in their action. The most satisfactory method of inducing vomiting is to give a draught of water and then to tickle the inside of the throat with a feather. Ipecacuanha wine is sometimes recommended as an emetic in croup or when in acute bronchitis the secretion is so profuse as to threaten blocking of the tubes. This drug, however, is depressing to the heart and we may choose a safe way by increasing our expectorant drugs and trusting to vomiting occurring spontaneously as it often does.

In poison cases we employ emetics chosen for their suitability to the type of poisoning. These are mentioned under the appropriate headings.

In no circumstances should emetics be employed for the recovery of foreign bodies such as coins, buttons, pins, etc., accidentally swallowed. If a foreign body can reach the stomach it is likely to pass on with less damage than will be incurred during a return journey violently induced by the efforts of vomiting.

EXPECTORANTS are drugs which induce an increased fluidity of the phlegm and thereby prevent it from clogging the bronchial tubes.

The expectorants commonly in use are of two classes, the first act as mild irritants to the mucous membrane of the stomach and reflexly on the bronchial mucous membrane. Of this class are ipecacuanha, squills, senega and ammonium carbonate. On account of this action, ipecacuanha is given in high doses when there are suffocative symptoms due to the blocking of the air-tubes with viscid mucus. Even if the drug fails to produce vomiting, much benefit will be derived from the increased fluidity of the mucus.

The action of ammonium carbonate in young children is sometimes pronounced, leading sometimes to gastric irritation or diarrhœa, so the salt must be used with caution. Other drugs, notably potassium iodide, act directly on the mucous membrane of the bronchi, increasing the secretion and in all probability helping to relax the spasm of the tubes which so often accompanies inflammatory conditions.

It follows from the above that expectorants should not be given when the bronchial tubes are already flooded with watery mucus; on the contrary, in such conditions it may be necessary to administer drugs such as atropine, which dry up the secretion.

The choice of expectorants will depend to a certain extent on other subsidiary action that they may have, thus ipecacuanha has a depressant action on the heart, but is a valuable antipyretic. The drug will therefore be indicated in the early stages of inflammatory disease of the lungs or air-passages, but in the later stages, when heart failure is to be feared, it will be replaced by squills which has an action on the heart similar to digitalis, though in a lesser degree.

The expectorant drugs must not be expected to control cough except by rendering the expulsion of sputum more easy; when there is but little mucus, but the air-tubes are inflamed and irritable, some sedative such as compound tincture of camphor or paregoric may be added to the mixture, but as this contains a

small quantity of opium, grain $\frac{1}{4}$ to sixty drops, it must be used with caution in the case of younger children.

MERCURY is a drug well tolerated by children. In the form of calomel it is a valuable purgative in acute febrile disease or when there is derangement of the liver function. When combined as it conveniently may be, with sodium bicarbonate, the powders should be made up fresh as required.

Grey powder, the familiar friend of the nursery, must be used only in the form of some well recognised brand of tabloid, to be crushed before use. The powder is liable to serious deterioration in this climate with the production of poisonous substances.

OPIUM and its derivatives must be regarded as the *most dangerous of all drugs in infancy* and early childhood. They should never be prescribed for infants under six years of age except under expert advice, and after that age strictly and only as directed on the foregoing pages. By the administration of cordials, soothing syrups or powders of unknown composition, we may run the risk of unwittingly administering opium or other narcotics.

Suitable doses of opium preparations for a child of one year.

Dover's powder grain $\frac{1}{8}$ to grain $\frac{1}{2}$.
Tinct. opii minim $\frac{1}{8}$ to minim $\frac{1}{2}$.
Tinct. camph. co. minims 2 to minims 4.
Injection morphine sulphate grain $\frac{1}{150}$ to grain $\frac{1}{100}$

The initial dose should be of the lower figure given, for purposes of ascertaining the tolerance. After this the dose may be increased according to the demands of the case.

PURGATIVES AND APERIENTS may be divided into two classes, the first for employment when it is desired to induce a rapid and copious evacuation of the bowels and the second, to be used as regulators to ensure daily action.

Of the first class, for all ordinary purposes castor oil is the safest and most satisfactory. In acute disease, however, and especially where there is derangement of the liver function, castor oil may cause vomiting. In such cases, calomel in appropriate doses, followed by a dose of salts, is the most suitable. The saline purgatives are used when it is desired to remove large quantities of fluid from the body or relieve cerebral congestion.

For the habitual regulation of the bowels we shall depend on the vegetable aperients, cascara, aloes or senna, perhaps assisted by some saline aperient.

It will be found that, for daily use, a combination of different drugs will not only be more efficient, but that a smaller dose proportionately will be required. For example, there may be

reason to believe that the muscles of the bowel are sluggish, at the same time the motions are hard and dry. A mixture containing cascara to stimulate the muscles combined with magnesium sulphate to render the motions more watery and liquid paraffin as a lubricant (No. 5) will be found in every way more satisfactory than a large dose of any one of the constituents.

Medicinal liquid paraffin is a valuable addition to the pharmacopœia, it has no action beyond that of a lubricant, so that no habit of dependence is established and it may be with advantage, combined with a tonic (No. 27).

Many fruits and other simple pleasant articles exert a laxative action, which will be utilised by the thoughtful parent before having recourse to the medicine chest :—such are prunes, figs, tamarinds, honey, treacle and manna.

STIMULANTS are required in acute illness to tide over periods of collapse and prostration. The majority act by increasing the force of the heart beat and raising the tone of the circulation. Stimulants may be divided into four classes, alcoholic, nutritive, drugs for administration by mouth and drugs for hypodermic use.

In childhood, undoubtedly, the most valuable stimulant is, *brandy* (for doses, *see* prescription No. 26). Caution should be exercised that excessive doses inducing narcosis are not employed. Alcohol in any form should not be given to children over long periods as there is danger that by doing so the liver may be damaged permanently.

Nutritive stimulants.—These are easily digested foods such as beef-tea, or meat jellies, having but slight food value, but mild stimulant and appetising qualities. The high value of glucose as a heart muscle stimulant has been mentioned in the text.

Of *medicinal stimulants* for administration by mouth as rapid restoratives we may mention sal volatile, ether, camphor and tincture of ephedra. For hypodermic administration we have at our disposal adrenaline, strychnine and camphor in oil. The use of digitalis or strophanthone is reserved for those cases where there is excessive rapidity of the pulse, as for instance sometimes in diphtheria or pneumonia but the drugs are not to be regarded as a direct heart stimulant.

TONICS are administered to restore the health and vigour of the child after debilitating illness or when from any cause the child is run down. The action of all tonics is not the same and it should be clear what the indications are and what conditions it is necessary to correct, before deciding on the particular form of tonic to be employed.

Tonics in general may be divided into six classes :—

1. Rebuilders, to replace mineral bodies especially calcium, iron and phosphates.
2. Stimulants to blood formation. Arsenic. Preparations of liver extract.
3. Vitamin-containing tonics. Cod-liver oil, adexolin, osteomalt and many others.
4. Appetisers. Gentian and quinine in small doses.
5. To restore muscular tone. Strychnine.
6. Digestive tonics. Mineral acids and Rhubarb.

Tonics should not be given till the cause of the disease is removed. Particularly is this the case with iron tonics which are frequently given to anæmic children with indigestion, with the result that the indigestion is increased and the iron is not absorbed.

It must not be forgotten that fresh fruits, vegetables and other food contain the constituents of most tonics in easily digestible form and have in addition the vitamin constituent, without which tonics are of no avail.

ENEMATA AND BOWEL IRRIGATION play an important rôle in the treatment of sick children. For the administration of enemata a funnel and tube are preferable to the customary enema syringe. The apparatus consists of a glass funnel or the barrel of an ordinary glass irrigating syringe, attached by some two feet of rubber tubing to a No. 8 rubber catheter.

Amount of enema. Infant at breast 1 to 2 ounces; one year 3 ounces; five years 4 ounces.

The tube, well vaselined, is introduced with a slight inclination to the left following the line of the bowel and the fluid at a temperature of about 100°F. is injected slowly.

As an alternative, glycerine one drachm in an ounce of water is injected with a glycerine syringe or one drachm with an ounce of olive oil.

The high enema or bowel wash is employed when it is desired to free the whole of the large bowel from irritating or toxic contents. For this purpose, larger quantities of saline solution are employed, as much as one pint for a child of six months and from one to two pints at the age of two years. If the motions are excessively acid as evidenced by scalding of the buttocks, sodium bicarbonate in the proportion of grains two to one ounce of the saline is added. Ample time must be allowed for the fluid to find its way along the bowel.

The method of administration is as follows :—The child lies on the back with the hips raised by a pillow. The catheter is inserted four or five inches into the rectum and the funnel held some eighteen inches above the level of the patient's hips. "When

sufficient fluid has been run in, it may be syphoned off by lowering the funnel and the process repeated till all the returning fluid is clear".

Medicines may be administered in the form of an enema when the child is unable to swallow or to retain them in the stomach. This route of administration is commonly employed during convulsions. On account of the slower absorption it is necessary to give twice the quantity which would be administered by mouth. Opium and its derivatives, on the contrary, are said to be more potent when given by the rectum, the quantity should, therefore, be half instead of double. It is, however, more convenient and exact to administer morphia by hypodermic injection.

Both medicinal and nutrient enemata should be preceded by a bowel wash.

Nutrient enemata.—The rectal route is employed when for any reason it is undesirable or impossible to administer fluids or food by the mouth. The more complicated methods of rectal feeding with peptonised milk, beef tea and other substances have been abandoned in favour of a solution of glucose one teaspoonful in an ounce of normal saline solution, the amount according to the age of the child. This can be repeated every four to six hours.

For the administration of fluid, the apparatus may be so arranged that a continuous drop is delivered. By this method, there is more hope of retention than if large quantities are administered at one time.

GASTRIC LAVAGE (GAVAGE, STOMACH WASH).

In certain conditions, as for instance when vomiting is persistent or in poisoning cases, it is desirable to wash out the stomach. The same apparatus is employed as for irrigation of the bowels. The introduction of the tube in young infants is simple as, if the tube is well smeared with glycerine and passed to the back of the mouth, it is readily swallowed. It is safer to pass the tube empty and pour the fluid into the funnel when it is evident, by the regurgitation of fluid into the tube that the lower end is in the stomach. The fluid usually employed is a solution of sodium bicarbonate, 2 grains to the ounce.

NASAL FEEDING is employed when it is impossible to give nourishment by mouth, as for instance in unconscious patients or when there is paralysis of the palate. The apparatus is similar to that employed for gastric lavage. The tube well oiled is passed along the floor of the nasal cavity and further down till it reaches the stomach. No fluid should be poured down the tube until it is certain that it has reached its destination, less fluid be introduced

into the larynx. When the necessary amount of nourishment has been administered, the tube is gripped firmly between the thumb and forefinger and withdrawn. The child should not be lifted from the bed for this purpose but should be kept approximately flat with the head and shoulders slightly raised.

LINSEED MEAL POULTICE.—

Directions for use :—Smear the skin with olive oil. To the sufficiency of linseed meal add boiling water and stir into a thick paste. Spread the paste about one-half inch thick or more on linen. Cover the surface of the meal with a thin gauze and apply.

THE MUSTARD PLASTER is used to relieve pain or applied to the epigastrium, is useful in relieving vomiting.

The plaster should be made of a mixture of flour and mustard well mixed before water is added. The strength is :— Mustard one, flour six, in infancy; mustard one, flour three or four, for older children.

The flour is made into a paste, spread between layers of muslin and applied. The skin should be inspected frequently to see that no blistering occurs. As a rule, the plaster should be removed after ten minutes and all traces washed off with soap and water.

HOT-WATER FOMENTATIONS are very useful in many cases. The water should be as hot as the patient can bear it. Two thickly folded and large flannels should be used, one being removed from the hot water and wrung out should be applied to the part; after an interval of two or three minutes, the second should be similarly applied upon the removal of the first, and the process continued for half an hour or more.

TURPENTINE STUPES may be applied by sprinkling a little turpentine upon the flannels when they are wrung out in hot water before application. The action must be watched carefully. Of late years, the use of poultices or other hot applications has given way to some degree to the employment of *thermogene wool* or *antiphlogistine,* both valuable preparations. Thermogene wool should not be employed after the skin has been oiled, lest blistering should take place.

Of the APPLICATION OF COLD to the surface of the body we have already spoken, but it may here be advisable to reiterate the importance of cold bathing, sponging or wet packing in conditions of high fever, restlessness or delirium.

THE VAPOUR BATH is valuable in cases of dropsy. The child quite naked, should be seated upon a cane-bottomed chair; a blanket reaching to ground on all sides should be thrown around

the patient, and tied at the neck so as to leave no aperture. A *chattie*, or other open vessel of boiling water having been placed under the chair, sweating soon commences, and it should be kept up for a quarter of an hour at least. The child should then be rapidly and thoroughly dried, and put into a warm bed. Another plan is to conduct steam beneath the bed-clothes, which have been raised from the body by arching a couple of bamboo twigs across the bed underneath them, through a hollow bamboo or India-rubber tube from the spout of a kettle; but care must be taken not to allow the jet of steam to impinge directly upon any part of the body.

A HOT PACK performed in the same way as a cold pack (*see* Chapter XXI), using very hot water, is also an admirable method of inducing perspiration in cases of dropsy or collapse.

A HOT BATH usually has a temperature of about 104°F. to 106°F., and the warm bath a temperature of 98°F. or 100°F. To be of use, the water should be deep enough to reach to the child's arm-pits. It is not of any consequence whether drying be effected completely, but it is important that it be done rapidly. The child should be wrapped in a blanket and put to bed, whether with or without his night-dress matters not, but a garment should be warmed previously to being put on. Irritation and pain are thus subdued, and probably perspiration induced.

The use of CARBOLIC ACID as an application or lotion for *infants and young children* is *to be deprecated.* Not only is carbolic acid poisoning, as evidenced by blood in the urine, easily produced, but there is a possibility of severe damage to the skin.

A MUSTARD BATH is used in certain cases of threatened collapse. It is prepared by using mustard in the proportion of one ounce to each gallon of warm water. To ensure equal diffusion, the mustard should first be made into a paste, and placed in a muslin bag, through which it should be squeezed into the water.

THE ALKALINE BATH made up as follows :—Sodium carbonate (washing soda) ¼ ounce or sodium bicarbonate ½ ounce to each gallon of water, is useful in irritative skin lesions, especially prickly heat.

ULTRA-VIOLET RAYS play an important part in the treatment of sick or debilitated children. It is now the practice of the writer to order this treatment for practically all children convalescent from serious disorders or suffering from wasting diseases. The value of this treatment in rickets has been mentioned.

APPENDIX I.

DIET FOR INVALIDS AND SICK CHILDREN.

1. Albumen Water.

The white of two or three fresh raw eggs is mixed well with a pint of cold water. The mixing is best done by shaking them together in a closed bottle. Then a pinch of salt is added, and, if preferred, a little Dill-water or sugar may be used for flavouring purposes.

2. Barley Water.

Two teaspoonfuls of washed pearl barley, one pint of cold water.
Put into a saucepan, and boil down to two-thirds. Strain.
A whole day's supply should not be made at once. It soon turns sour. Once made it should never again be heated to boiling.

3. Barley Jelly.

(1) Soak four level tablespoonfuls (or three ounces measured in a medicine measure) of well-washed pearl barley in a quart of warm water for an hour. Boil, then keep just about boiling for three hours. While hot, strain through muslin or a very fine, perfectly clean, boiled wire gauze gravy strainer into a scalded jug. Cover loosely, cool rapidly in running water; keep in a cool airy safe. Make fresh every day.

(2) Rub two level tablespoonfuls of Robinson's Barley into a paste with cold water, and make up to three-quarters of a pint by stirring in boiling water. Boil gently for half an hour, and make up at the end of that time to three-quarters of a pint. (A more accurate method is to measure two ounces of Robinson's Barley in a medicine measure and make up to a pint with water.) Treat as above.

4. Oat Jelly.

Proceed as for Barley Jelly, using Oatmeal instead of Barley-flour. A simpler way is to take equal parts of boiling water and well-boiled porridge, bring to the boil, stir for a few minutes, then strain, cool, and keep cool as above.

After 15 months of age, if the baby has good digestion, use a coarser strainer, the handiest being the cylindrical flour-dredger in common use. If the boiled oatmeal is placed in this while boiling-hot, a few turns of the handle will cause all that is fine enough to go through, and the result is a kind of strained, jelly-like Porridge. The dredger can be readily cleansed, and should always be boiled just before use. Thin ordinary gruels can be made by using about half the proportion of meal given in the above recipes (Truby King).

5. Rice Water.

Wash well one ounce of good rice in cold water. Then macerate for three hours in a quart of water kept at tepid heat, and afterwards boil slowly for one hour and strain.

6. Rice Jelly.

Proceed as for Jelly—using whole rice. Rice Jelly is preferable to Barley Jelly if the bowels are relaxed. Oats Jelly is the most laxative.

Rice Water or *Barley Water* may be made by using six times as much water as for preparing the jelly; or by adding five parts of boiling water to one of the prepared jelly.

7. Vegetable Broth.

Take a pint of beef tea, mutton or chicken broth. Add a handful of mixed vegetables—cabbage, spinach, carrots, onions, and fresh or dried peas and beans. Allow to simmer for one hour and strain through muslin.

From two to four ounces may be added daily to one bottle after the fifth month.

8. Lemon Sago Pudding.

Boil two ounces sago in three-quarters of a pint of water till cooked; then mix with it three ounces of golden syrup and the juice and rind of one lemon, put in a mould and turn out when cold. If the grated rind is not liked, thinly peel the lemon and boil in the water for a few minutes and strain before adding the sago.

9. Raisin Tea.

Half a pound of raisins split and stoned, one pint boiling water. May be infused like tea, or cook the raisins and water rather slowly for about two hours. Strain and take hot or cold.

10. Beef Tea.

Put half a pound or a pound of rump steak, cut up into small pieces, into a covered saucepan, with one pint of cold water. Let it stand by the side of the fire for four or five hours, and let it then simmer gently for two hours. Skim well, and serve.

11. Chicken Broth.

A chicken thoroughly cleaned and with all the skin and fat removed is to be chopped, bones and all, into small pieces; put them, with a little salt, into a saucepan and add a quart of boiling water; cover closely and simmer over a slow fire for two hours; after removing allow to stand, still covered, for an hour; then strain (Starr).

12. Mutton Broth.

Cut one pound of lean mutton into small pieces and place it in a saucepan with three pints of cold water; add a little salt. Heat to boiling point and then allow it to simmer for three hours; strain, and when cold, skim off the fat. Serve warm.

13. Juice of Raw Meat.

Take a pound, or whatever quantity required, of the best rump steak, free from all fat. Cut it into the finest mince. Put it into a bowl. Add cold water, to which a few drops of diluted hydrochloric acid and a pinch of salt have been added, just sufficient to moisten the mass well. Set aside to stand for an hour, during which time it may occasionally

stirred. Strain through a coarse cloth, using pressure. The pulpy ss of flesh ought to be nearly bleached, while the liquid should be of a port-wine colour.

14. Custard Pudding.

Take half a pint of milk with one ounce of Benger's or Allenbury No. 3 and boil together, then cool and add two eggs and two teaspoonfuls of sugar which have been well beaten up. Place in pie dish and bake. Flavour with nutmeg. Serve hot or cold.

15. Lime Water.

Add two ounces of slaked lime to one gallon of pure water, in a stoppered bottle, shaking well for several minutes. Allow the bottle to stand without any agitation till the superfluous lime is deposited at the bottom, the solution above being perfectly clear. The bottle should stand for twenty-four hours before the clear solution is drawn off for use. Water is capable of dissolving only a certain small proportion of lime, the proper proportion to constitute "lime water" being just as much as the water can dissolve.

A bottle containing lime water should always be kept well corked; access of air spoils lime water.

16. Whey.

N.B.—Always keep jugs, containing milk, whey or other food for babies loosely covered to exclude falling particles, flies, etc., but not to prevent access of air. A piece of clean white paper through which the thermometer can be thrust, serves the purpose.

To make 12 ounces of whey.

Put 18 ounces of milk in a jug. Keep a dairy thermometer standing in the milk and heat to 105 deg. Fahrenheit, by placing the jug in a saucepan of hot water. Stir in thoroughly a teaspoonful of best Rennet extract; allow to stand for three minutes, when a firm curd should have formed. Break up thoroughly with a perfectly clean fork. Replace jug in saucepan. Heat up to 160 deg. Fahrenheit, reading the thermometer when the bulb is about the middle of the whey—not in the curd or near the top. Draw the saucepan aside so that the temperature may remain about 160 deg. Fahrenheit for ten minutes; now pour off the whey from the curd (which should have sunk in a lump to the bottom of the jug), straining it through a scrupulously clean boiled strainer........Complete clearing of the whey is sometimes desired when a baby is ill. This may be promoted by carefully cutting the curd into blocks, with a sharp dinner knife, after it has set very firmly, instead of breaking it up with a fork.

"Food Value" of Whey.

Whey made from new milk contains about a third of the fat of the milk: whey made from skim milk contains little fat: if from "separated" milk, almost no fat.

The thinnest, clearest, most transparent Skim-milk-whey has fully a third of the "food value" of New Milk, and contains four times as much food per pint as beef tea. Whey may therefore be of great practical importance in tiding a sick or delicate baby over a critical period—a period when it happens to be necessary to exclude almost completely both Fat and Casein, giving for the time being a solution of Sugar of

Milk and Soluble Albumen—in other words, "Skim-milk-whey". The mother is apt to regard such a diet as nearly valueless whereas it is "as strong as" thick Oat Jelly, and contains seven times as much food as Barley Water. Moreover, the solids of Whey are specially adapted to the digestive capacity of the young infant, while the solid in Barley Jelly, etc., is almost pure starch—a substance not present in the natural food of any young mammal. However, Whey is not a complete food for continued use.

Though Whey tends to be laxative, it often agrees well in the early stages of convalescence from diarrhœa, especially if milk boiled for ten minutes be added to it step by step, say, at the rate of an ounce a day, up to three ounces per pint. Then a gradual return may be made to Humanised Milk (Truby King).

17. Lime Whey.

Bring half a pint of milk to the boil. Remove and squeeze a few drops from a fresh lime (Limbu) into the milk. Stir well and allow to simmer on the stove for a few minutes, then set aside and strain through muslin.

This is a good method, easily and cheaply done. To each six ounces of this whey, add a level teaspoon of sugar of milk: and a pinch of bicarbonate of soda or sodium citrate, if you are intending to use it as a diluent of milk.

18. White Wine Whey.

To a breakfast cupful of new milk in a saucepan, placed upon a fire, add a wineglassful of cheap cooking sherry when the boiling-point has been reached. Then boil again for one minute and strain off the curd. Sweeten with sugar. A feeble infant will take a tablespoonful every fourth hour.

19. Calcium Whey.

Take 15 ounces of milk, bring to the boil, add 30 grains of calcium lactate, stir and allow to simmer two or three minutes, then cool. The milk will now set and the curd may be broken up and the whey strained off through butter-muslin. Fifteen ounces of milk will make approximately 10 ounces of whey.

20. Junket.

Take a pint of new milk to which a teaspoonful of sugar has been added and let it stand in a bowl near a fire or on a stove, until it has warmed to blood heat (about 100 deg. Fahrenheit), then add two teaspoons of essence of Rennet and stir gently for a few seconds. Allow to stand for a little distance from the fire until the curd is firmly set: then place in a cool place until required.

21. Milk Jelly.

Take half a pint of milk, quarter ounce of gelatine, rind of half a lemon and one ounce of white sugar. Put the gelatine in a saucepan with the milk and add the sugar, then peel off the lemon rind very thinly, and add it to the other ingredients, stir over very moderate heat until the gelatine is melted. Then strain into a basin and stir occasionally until cool. Finally, pour into a prepared mould and place in a cold place until set.

22. Peptonised Milk.

Add a pint of boiling water to a pint of new milk. Then add two teaspoonfuls of Benger's *liquor pepticus,* and twenty grains of the bicarbonate of soda. Mix well, and put it aside *in a warm but not hot place* for an hour, in a jug. Then pour it again into the saucepan and boil for two minutes to prevent further action of the ferment. Sweeten to taste with sugar of milk.

The same object may also be attained by the use of "Fairchild's Peptonising Powders". Printed directions accompany each box of powders.

23. Protein Milk.

This is a food made by adding the curds of one quart of milk (the whey having been separated and discarded) to one pint of water and one pint of Buttermilk. It contains very little sugar, a moderate fat, a high proteid content and is *exceedingly valuable in cases of severe fermentative diarrhœa, certain cases of marasmus and chronic dysentery.*

The directions for making it are as follows:—One quart of fresh milk is warmed to blood heat and to this is added half ounce of liquid Rennet. Stir for a moment and allow to stand for 20 minutes until jellied. Then strain off and discard the whey and wash the strained curd twice with cold boiled water, after which the dry curd is rubbed through a fine sieve with a wooden spoon. This requires some effort, but is essential. After the curd has been mashed through the sieve, gradually add to it one pint of Buttermilk and finally sufficient boiled cold water to make a quart mixture altogether. One grain of saccharine to the quart may be added to make it most palatable to infants. The food when finally strained is smooth and homogeneous and will readily pass through a teat. It is not necessary to dilute it. It should not be heated above blood heat. It should not be given for more than a week. The quantities to be given and the times are the same as for the ordinary milk feeds of the age.

24. Skim Milk.

Take a small enamel douche can, insert a cork in the tube outlet, and simmer therein fresh milk for half an hour, then remove and place on ice for two hours. The fat of the milk will by then have all risen to the top, and the lower two-thirds in the vessel can then be obtained by removing the cork from the outlet and letting the milk run into a clean jug. This milk is to all intents fat-free, and should be given diluted 1 in 3 to start with, gradually increasing its strength.

25. Top-Milk.

The term top-milk has been applied to the upper layers of milk which has stood for some time and into which the main cream content has risen. Top-milk, by suitable dilution, can be converted into a food of balance closely approximating that of breast milk. One pint or one quart of fresh milk is placed in a glass douche can surrounded by ice, or if preferred, a convenient apparatus (Maw's Milk Humaniser) may be obtained.

The amount of cream which will rise to the upper layers will depend on the length of time of standing.

Taking a good average milk with fat percentage of 3.4 to 3.8, after four hours the composition of the top quarter will be:—Fat 7 per cent., protein 4 per cent., sugar 4 per cent. The top quarter only is used, the lower three-quarters being syphoned off. This is diluted to half, with the

resultant composition of protein 2 per cent., fat 3.5 per cent., and sugar 2 per cent.

Sugar at the rate of 1 ounce to one pint of the mixture is finally added. The resulting mixture may thus be compared to human milk:—

	Protein.	Fat.	Sugar.
The mixture ..	2 per cent.	3.5 per cent.	7 per cent.
Human milk ..	1.5 „ „	3.9—4 „ „	7 „ „

It is essential that the milk be stood on ice or kept in a refrigerator during separation.

The slightly lower fat content and higher protein content of the top milk mixture are to be regarded as desirable (Truby King).

APPENDIX II.

PRESCRIPTIONS.

Classified as Follows:

Internal.	No.	*Internal*—contd.	No.
Aperients and purgatives	1—5	Stimulants	26
Carminatives ..	6—7	Tonics	27—30
Diarrhœa mixtures ..	8—10	Tonsillitis mixture ..	31
Digestive and liver stimulants	11—13	Gargles	32—33
Enemata	14—16	Throat paints ..	34—35
Expectorants or cough mixtures	17—19	Urinary antiseptic ..	36
Antiseptic and expectorant	20	*External.*	
Fever mixtures ..	21—22	Dusting powder ..	37
Linctus	23	Liniments	38
Sedatives	24—25	Lotions	39—40
		Ointments	41—44

(*N.B.*—The difficulty of stating the doses of medicines for children of all ages is very great, indeed almost impossible. A rule generally applicable is here stated with the object of releasing parents from occasional dilemma, but it should be remembered that it is not applicable to all drugs. Reference has been made in the text to those drugs which must be handled with special care and the warning against the indiscriminate use of such highly dangerous drugs as Opium and Strychnine may be repeated. The reader is also particularly requested to peruse carefully Chapter XXXIII, the Administration of Remedies.)

Rule for the calculation of the dosage of the commoner non-poisonous drugs in childhood:—

Add twelve years to the age of the child and divide the actual age by the result. The fraction so obtained will give the fraction of the adult dose suited to the child. Example, a child is aged 4 years; 4 *plus* 12 is 16. Therefore four-sixteenths, that is one-fourth, of the adult dose is the proper dose for the child in question. Put shortly $4 + 12 = 16$ $4/16 = \frac{1}{4}$ the adult dose.

For infants of three months 1/30 full dose or 1/3 dose for one year.
For infants of six months 1/20 full dose or 1/2 dose for one year.
For infants of nine months 1/15 full dose or 2/3 dose for one year.

Aperients and Purgatives.

1. Castor Oil.

Dose—Half a teaspoonful for a child under one year of age. One teaspoonful at one, increasing to two teaspoonfuls at three.

Aperients and Purgatives—contd.

2. Castor-Oil Emulsion.

Take of
Castor Oil, one ounce.
Powdered gum acacia, three drachms.
Powdered loaf sugar, three drachms.

Aperients and Purgatives—contd.

Oil of peppermint, two drops.
Rub the acacia, sugar, and oil of peppermint together into a powder; add about six drachms of water; then add the castor oil by degrees, with a little more gum or a little more water, as may be necessary to make a perfect emulsion. Then add water slowly to bring the quantity to *four ounces.* Of this mixture one tablespoonful equals one teaspoonful of castor oil, and a teaspoonful equals fifteen drops.

Dose—For inflammatory diarrhœa, half to a whole teaspoonful every fourth or sixth hour for a child of two or three years.

Or,

Castor oil, one drachm.
Gum acacia, twenty grains.
Syrup, two drachms.
Carraway water to one ounce.

Dose—One drachm (equal seven and a half drops), every fourth hour, or oftener for a child of one year.

3.

Take

Magnesium sulphate, five grains.
Sodium sulphate, five grains.
Magnesium carbonate, two grains.
Peppermint water, one drachm.

Dose—One drachm at one year, two at three years, three at six years, to be repeated in six hours if necessary.

4.

Take

Liquid extract of cascara, five minims.
Liquid extract of liquorice, five minims.
Syrup of orange peel, ten minims.
Chloroform water to one drachm.

Dose—One drachm at one year, two drachms at three years, three drachms at five years (the dose may be increased according to individual requirements). Tincture of belladonna one minim may be added to each drachm if there is griping.

5.

Take

Syrup of figs, thirty minims.
Extract cascara aromat., five minims.
Liquid paraffin, one drachm.
Decoction of Irish moss to two drachms.
(To which may be added magnesium sulphate ten grains or more as required.)
To be made into an emulsion.

Dose—For a child of one to two years, one to two drachms, older children up to half an ounce as required once or twice a day.

(*N.B.*—The mixture is apt to froth over and sometimes blow out the cork, but this does not detract from its value.)

Carminatives.

6.

Take

Sodium bicarbonate, two grains.
Aromatic spirit of ammonia, two minims.
Glycerine, five minims.
Chloroform water to one drachm
To which may be added tincture of belladonna one to two minims as required.

Dose—One drachm three-hourly or more often for a child of one.

7.

Take

Sodium bicarbonate, two grains.
Potass. bromide, one grain.
Tincture of belladonna, one minim
Spirit ammon. aromat., two minims.
Aq. menth. pip. to one drachm.
Three-hourly.

Diarrhœa Mixtures.

8.

Take

Aromatic chalk powder, five grains.
Tincture of catechu, five minims.
Mucilage, fifteen minims.
Peppermint water to one drachm.

Dose—One drachm at one year, two at three, three at seven.

9.

Take

Bismuth carbonate, five grains.
Sodium bicarbonate, three grains.
Tincture of belladonna, one minim.
Mucilage of tragacanth, ten minims.
Peppermint water to one drachm.

Dose—One drachm at one year, two drachms at three.

(*N.B.*—When specially indicated, tincture of opium may be added one-fourth to half minim for a child of one year old, not more than one minim in the twenty-four hours. Or tincture camphor co., minims two to each dose.)

10.

Bael fruit (the half-ripe fruit, if obtainable, is best, but the dried fruit also is of value) is an useful remedy in the convalescent stage of acute diarrhœa or in chronic diarrhœa.

Take of the soft interior pulp, half an ounce, mix with one ounce of milk or water; sweeten to taste; take two or three times a day. (Caution *see* Chapter XXXIII).

Digestive and Liver Stimulants.

11. RHUBARB AND GREY POWDER.

Take

Pulv. hydrarg. cum cretæ, half grain.
Pulv. rhei co., two grains.
Cinnamon, one-fourth grain.

Dose—The powder for a child of one to two, once or twice daily.

Digestive and Liver Stimulants—contd.

12. ACID GENTIAN MIXTURE.

Take

Ammonium chloride, one grain.
Acid hydrochloric dil., three minims.
Infusion gentianæ co., to two drachms.

Three times a day after meals. Dose suitable for a child of four.

13. ALKALINE GENTIAN MIXTURE.

Take

Magnesium carbonate, two grains.
Tincture nucis vom., one minim.
Infus. rhei, thirty minims.
Infus. gentianæ co., ad. two drachms.

Three times a day, twenty minutes before meals. Dose suitable for a child of four.

Enemata.

14. SIMPLE.

Mix sufficient soft or pure toilet soap with warm water to make the water thoroughly soapy. Usual proportion, one ounce of soft soap to one pint of water.

15. SALINE.

Common salt, one heaped teaspoonful to a pint of water. Amount as shown in Chapter XXXIII.

15(*a*). TURPENTINE.

Not commonly used in young children. Two drops turpentine in hot water made into emulsion with soap.

16. OLIVE OIL.

Olive oil, one ounce.
Glycerine, one drachm.

Amount proportionate to size of child, one to two ounces at one year.

Expectorants.

17.

Take

Ipecacuanha wine, two and a half minims.
Sodium bicarbonate, two and a half grains.
Spirit of nitrous ether, two and a half minims.
Syrup, ten minims.
Water to one drachm.

Dose—One drachm four-hourly for a child of one year old, two drachms at five.

18.

Take

Ammonium carbonate, half a grain.
Ipecacuanha wine, two and a half minims.
Tincture of senega, five minims.
Oxymel of squills, five minims.
Water to one drachm.

Dose—One drachm at one year old, two at five and three at ten, four-hourly.

19. FOR STICKY AND DIFFICULT EXPECTORATION.

Take

Potassium iodide, half a grain.
Ammonium carbonate, half a grain.
Ipecacuanha wine, two and a half minims.
Syrup of orange, ten minims.
Water to one drachm.

Dose—One drachm four-hourly for a child of two, two drachms at five.

Antiseptic and Expectorant.

20. FOR BRONCHITIS AND BRONCHO-PNEUMONIA.

Creosote, quarter minim.
Tincture benzoini co., two and a half minims.
Oil of cinnamon, quarter minim.
Vini ipecacuanhæ, two minims.
Syrup of tolu, ten minims.

Antiseptic and Expectorant—contd.

Glycerine, ten minims.
Water to one drachm.

Dose—One drachm at one year, two at three, three at six, four at eight, three times a day.

Fever Mixtures.

21.

Take

Solution of acetate of ammonia, ten minims.
Sweet spirits of nitre, two minims.
Potassium citrate, five grains.
Syrup, fifteen minims.
Water to one drachm.

Dose—One drachm four-hourly to a child of one year, two drachms at three, three at seven, four-hourly.

22. IMPERIAL DRINK.

Take

Potassium acid tartarate, one drachm.
Lemon juice, half ounce.
Sugar, half ounce.
Hot water to one pint to be drunk cold.
To be taken freely.

Linctus.

23. LINCTUS FOR COUGH.

Oxymel scillæ, ten minims.
Syrup of tolu, ten minims.
Glycerine, ten minims.
Water to one drachm.

Dose—One drachm four-hourly or more often if necessary.

Sedatives.

24.

Take

Phenazone, one grain.
Sodium bromide, two grains.
Glycerine, ten minims.
Aqua camphoræ to one drachm.

Dose—One drachm thrice daily to a child of one year old to be increased if necessary (Gt. Ormond St.)

Sedatives—contd.

25.

Take

Bromide of potassium, one grain.
Water, one drachm.

Dose—One drachm for a child of one year old, may be repeated within half an hour if the child is not drowsy and increased if convulsions are threatening (*see* also Chapter XIV).

25(*a*).

Take

Chloral hydrate, one grain.
Glycerine, ten minims.
Water to one drachm.

Dose—Suitable for a child of one year, may be increased as circumstances demand. May be added to prescription No. 25.

Stimulants.

26.

Brandy, five minims, diluted one to twenty for child of one year old up to one-fourth ounce in twenty-four hours.
Ten minims diluted one to ten for a child of four up to half ounce in twenty-four hours.
Usually given four-hourly, but may be increased to hourly over a short period of emergency.

26(*a*).

Take

Spirits of ether, two minims.
Aromatic spirit of ammonia, three minims.
Carraway water to one drachm.

Three-hourly.

Tonics.

27.

Take

Liquid paraffin, thirty minims.
Calcium hypophosphite, one grain.
Benzoate of soda, one grain.

Tonics—contd.

Essential oil of almonds, 1/24th minim.
Chloroform, 1/16th minim.
Decoction of Irish moss to one drachm (Gt. Ormond St.)

Suitable for a child of two, double at four, thrice daily.

28. Iron and Cod-Liver Oil.

Take

Syrup of iodide of iron, ten minims.
Cod-liver oil, fifty minims.

Dose—Half to one teaspoonful thrice daily to a child of two years.
One teaspoonful of extract of malt may be added to each dose.

29. Cod-Liver Oil Emulsion.

Take

Cod-liver oil, thirty minims.
Mucilage of acacia, five minims.
Decoction of Irish moss, twenty-five minims.
Oil of cinnamon, 1/40th minim.
Oil of almonds, 1/16th minim.
Elixir of gluside, 1/5th minim.
Chloroform, 1/16th minim.
Benzoic acid, 1/16th grain.
(Gt. Ormond St.)

Suitable for a child of one year. Double dose at three. Three times a day.

30. Iron and Arsenic.

Take

Syrup ferri phosphatis, fifteen minims.
Acid phosphoric dil., two minims.
Liquor strychninæ hydrochlor., quarter minim.
Liquor arsenicalis, half minim.
Syrup aurantii, ten minims.
Water to two drachms.

Three times a day. Suitable for a child of four.

Tonsillitis Mixture.

31. FOR TONSILLITIS OR INFLAMMATION OF THE MOUTH.

Take

Potassium chlorate, two grains.
Compound tincture of cinchona, five minims.
Acid nitro-hydrochloric dil, one and a half minims.
Glycerine, ten minims.
Water to one drachm.

Dose—One teaspoonful three to four times a day at two years. Double the dose at five. (King's College Hospital).

Gargles.

32.

Take

Potassium chlorate, ten grains.
Tincture of myrrh, five minims.
Water to one ounce.

33.

Take

Acid carbolic, one minim.
Sodii bicarb., ten grains.
Sodii chloride, ten grains.
Glycerine, one drachm.
Sugar, one drachm.
Water to two ounces.

Thrbat Paints.

34.

Take

Salol, twenty grains.
Spirit rectificat, three drachms.
Oil of peppermint, one minim.
Glycerine, to one ounce.

May be applied to the throat four-hourly. (Gt. Ormond St.).

35.

Take

Resorcin, forty grains.
Acid carbolic, eight minims.
Spirit menth. pip., twenty minims.
Glycerine to one ounce.

To be applied two or three-hourly.

36. URINARY ANTISEPTIC.

Take

Hexamine, three grains.
Sodium acid phosphate, three grains.
Sodium benzoate, two grains.
Syrup of orange, twenty minims.
Water to two drachms.

Dose—Two drachms three to four times a day for a child of four.

External Applications.

37. DUSTING POWDER.

Take

Oxide of zinc, one part.
Powdered starch, three parts.
Mix thoroughly in a mortar.

38. STIMULATING LINIMENT.

Take

Turpentine liniment.
Olive oil.
Of each equal parts.

Lotions.

39. EVAPORATING LOTION.

Take

Sal ammoniac, one-and-a-half drachms.
Methylated spirits, six drachms.
Water to six ounces.

Mix and apply on thin layers of muslin.

40. SOOTHING SKIN LOTION.

Take

Calamine prep., fifteen grains.
Zinc oxide, ten grains.
Liquor calcis, one drachm.
Glycerine, one drachm.
Water to one ounce.

Ointments.

41. RINGWORM OINTMENT.

Take

Chrysophanic acid, ten grains.
Lanoline, half ounce.
Soft paraffin to one ounce.

42. ZINC OINTMENT.

Take

Oxide of zinc, eighty grains.
Lanoline, half ounce.
Soft paraffin to one ounce.

Ointments—contd.

43. Sulphur Ointment.

Take

Precipitated sulphur, one ounce.
Lanoline, two ounces.
Soft paraffin, two ounces.

Ointments—contd.

44. Antiseptic Ointment for Acute Skin Inflammations.

Take

Resorcin, ten grains.
Ammoniated mercury, five grains.
Lanoline and soft paraffin of each half an ounce.

APPENDIX III.

VITAMIN CONTENT OF THE COMMON FOOD-STUFFS.

Appendix by J. P. Bose, M.B., F.C.S.

FOOD-STUFFS.	VITAMINS.			
	A.	B.	C.	D.
Cereal Products—				
Bajri	+	++	....	....
Barley	+	++	....	....
Bread (white)	....	+	....	....
Bread, whole meal	+	++	....	....
Maize (yellow) (*makai*)	+	++	....	....
Oats	+	++	....	....
Rice, polished	....	....	....	....
Rice polishings (*kunra*)	+	++	....	....
Rice, unpolished	+	++	....	....
Sago	....	....	....	....
Sooji (*semolina*)	+	++	....	....
Wheat flour, white (*maida*)	....	?	....	....
Wheat flour, whole meal (*atta*)	+	++	....	....
Lentils (dal)—				
Dals (general)	+	++	....	....
Gram (*chola*)	+	++	....	....
Gram (germinating)	+	++	++	....
Soya bean	+	++	....	....
Milk and Milk Products—				
Butter (*makhan*)	+++	....	....	+
Cream (*sar*)	+++	+	....	+
Cheese	++	?	?	....
Dahi	++	+	+	....
Ghee	+++	....	....	....
Milk, cow's, raw	+++	++	+	+
Milk, cow's, boiled	+	+	....	....
Milk, human	+	+	+	....
Milk, goat's	+++	+	+	+
Milk, buffalo	+++	+	+	+
Green Vegetables—				
Asparagus (*soot moolee*)	+	+++	+	....
Beans, string (*barbati*)	....	++	+	....
Brinjal (*baigun*)	?	+	+	....
Cabbage (*banda kobi*)	+	+++	+++	....
Cabbage, boiled	+	++	++	....
Cauliflower (*phool kobi*)	+	++	+	....
Cucumber (*sosha, khira*)	....	+	++	....
Lady's finger (*dhanrose, bhindee*)	....	+	+	....
Lettuce (*saladh*)	++	++	+++	....
"Patol" (*pulval*)	....	+	+	....
Peas, green	++	++	+?	....
Spinach (Indian) (*palong sag*)	+++	+++	+++	....
Squash	++	?	?	....
Turnip tops (*shalgam sag*)	+++	+++	++	....
Tomato (*belati baigun*)	++	+++	+++	....

FOOD-STUFFS.	VITAMINS.			
	A.	B.	C.	D.
Tubers and Root Vegetables—				
Artichoke (*hathichuck*)	....	+	+	....
Beet (*chukander*)	?	+	?	....
Carrot (*gajar*)	++	++	++	....
Garlic (*rasun*)	?	?	++	....
Nol-kole (*ole kobi*)	....	+	+	....
Onion (*piaj*)	?	++	+	....
Potato, raw (*alu*)	+	++	++	....
Potato, boiled	?	++	++	....
Raddish (*moola*)	?	+	?	....
Sweet potato (*ranga alu*)	++	+	?	....
Turnip (*shalgam*)	?	++	+	....
Yam (*kochu*)	....	+	+	....
Fresh Fruits—				
Apples	+	+	+	....
Banana (*kela*)	?	+	+	....
Grapes (*angoor*)	....	+	+	....
Guavas (*peara*)	....	+	+	....
Lemon (*pati nebu*)	....	++	+++	....
Mango (*alm*)	+	....	++	....
Orange (*kamla nebu*)	+	++	+++	....
Pomegranate (*bedana*)	....	+	+	....
Papaya	+	+	++	....
Pears (*naspati*)	?	+	?	....
Peaches	....	....	++	....
Pineapple (*anaras*)	....	....	++	....
Sugar cane (*alk*)	....	+	+	....
Watermelon (*tarbuj*)	....	....	+	....
Dried Fruits—				
Dates (*khejur*)	....	+	....	....
Raisins (*kissmiss*)	....	+	+	....
Nuts—				
Almonds (*kagji badam*)	+	++	....	....
Cocoanut kernel (*narkel*)	+	++	....	....
Cocoanut milk	....	++	....	....
Pea-nuts (*cheena badam*)	+	++	....	....
Walnuts (*akhrote*)	+	++	....	....
Eggs, Fish, Meat—				
Egg, yolk	++	+	....	+
Egg, white	....	....	....	....
Fish (*hilsa*)	++	+	....	?
Fish, fresh water	+	+	....	....
Fish, roe	+	++	....	....
Meat, raw	+	+	+	....
Meat, cooked	+	+	?	....
Meat, salted	....	....	....	....
Meat, tinned	....	....	....	....
Brain	+	++	....	....
Liver	++	++	+	+
Animal Fats and Vegetable Oils—				
Cocogem (vegetable ghee)	....	....	....	....
Cocoanut oil	+	....	....	?
Ground nut oil (*badam oil*) ..	+	....	....	....
Olive oil	?	....	....	....
Gingelly, oil (*til oil*)	....	....	....	....
Mustard oil (*sarshu oil*)	....	....	....	....
Fat, beef	++	....	....	....
Fat, mutton	+	....	....	....
Cod-liver oil	+++	?	....	+++
Lard	....	....	....	....

FOOD-STUFFS.	VITAMINS.			
	A.	B.	C.	D.
Sweets—				
Glucose	....	....	....	....
Honey	....	+	....	....
Molasses (*goor* or *jagri*)	....	+	....	....
Sugar, white	....	....	....	....
Sugar, brown	....	....	....	....
Sugar cane	....	+	+	....
Miscellaneous—				
Condensed milk	+	+	....	....
Coffee	....	....	....	....
Jam	....	....	....	....
Sandesh	....	....	....	....
Tea	....	....	....	....
Yeast (*bakhor*)	....	+++	....	....

? indicates that the "Vitamin" content is variable.
\+ indicates that the food contains the "Vitamin".
++ indicates that the food is a good source of the "Vitamin".
+++ indicates that the food is an excellent source of the "Vitamin'

APPENDIX IV.

Suggestions for the Mofussil Medicine Chest.

1. Castor oil, one bottle.
2. Epsom salts (magnesium sulphate), 4 oz.
3. Brandy, 2 oz.
4. Ipecacuanha wine, 1 oz.
5. Turpentine liniment for rubbing the chest, 4 oz.
6. Friar's balsam for inhalation, 1 oz.
7. Olive oil, one bottle.
8. Glycerine, 2 oz.
9. Funnel and tube for administering enema.
10. Dressing forceps.
11. Surgical scissors.
12. Gauze, plain sterile, two 1 oz. packets.
13. Cotton-wool, 1 lb. packet.
14. Tincture of iodine, 2 oz., in glass-stoppered bottle.
15. Spirit rectified, 4 oz., in glass-stoppered bottle.
16. "Hansaplast" Leucoplast rapid dressing (Beiersdorf, Ltd.)
17. Bandages, open wove 3 ins., one dozen.
18. Tannafax, 4 oz. tube (Burroughs Wellcome & Co.).
19. Borofax, 1 tube.
20. Boracic acid powder, 2 oz.

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J

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V